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POLYCHLORINATED BIPHENYL CONCENTRATIONS OF EIGHT SALMONID SPECIES FROM THE WISCONSIN WATERS OF LAKE MICHIGAN: 1985

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ABSTRACT

Nearly 800 (791) individuals of 8 species of salmonids were collected between March and November 1985 from the Wisconsin waters of Lake Michigan and analyzed for concentrations of polychlorinated biphenyls (PCBs) to determine levels of the contaminant and to identify spatial and/or seasonal variation of PCB concentrations. Spatial variation of brook trout (*Salvelinus fontinalis*), rainbow trout (*S. gairdneri*), brown trout (*Salmo trutta*), and chinook salmon (*Oncorhynchus tshawytscha*) was evident. Seasonal differences between lake zones occurred for rainbow trout, brown trout, and chinook salmon while seasonal differences within lake zones occurred for rainbow and brown trout from Green Bay, lake trout (*Salvelinus namaycush*) from the main lake basin, and chinook salmon from all three lake zones. Neither spatial nor seasonal variation was evident for coho salmon (*O. kisutch*). Elevated PCB levels were found in Green Bay splake (*S. fontinalis* X *S. namaycush*) and Sheboygan River brook, rainbow, and brown trout. I recommend: 1) modifying the format of the Lake Michigan fish consumption advisory to facilitate the separation of Green Bay and the Sheboygan River from the remaining Wisconsin waters of Lake Michigan; 2) expanding contaminant monitoring efforts to include the salmonid forage base; and 3) establishing specific monitoring sites and sampling dates to reduce spatial and seasonal variability.

CONTENTS

INTRODUCTION

This study was undertaken to determine the extent of geographical and/or seasonal variation of PCB contamination in Lake Michigan salmonids and to establish a data base for development of a consumption advisory for those fish. Environmental contamination by toxic organic chemicals has become a widespread problem in the Great Lakes during the past twenty years, adversely affecting the health of both fish and wildlife communities and detracting from the recreational and occupational use of the lakes by humans. Polychlorinated biphenyls (PCBs) are one of the most ubiquitous of these contaminants and have received most of the attention from scientists and concerned citizens.

Commercial production of PCBs began in 1930 by Swann Research, Inc. of Anniston, Alabama. Swann Research, which was later succeeded by the Monsanto Industrial Chemicals Co., marketed PCBs under the trade name Aroclor (registered trademark of the Monsanto Industrial Chemicals Company) and described them as a complex mixture of chlorine substituted biphenyls with a broad range of physical properties ranging from a light oil to a hard resin depending on the number of chlorine substitutions (Penning 1930). Aroclors differed from each other by the percent chlorine that was added to the biphenyl compound during the chlorination process. For example, Monsanto used names such as Aroclor 1248, 1254, and 1260 to indicate 48%, 54%, and 60% chlorine, respectively (Table 1).

PCBs have several physical characteristics which made them very useful in commercial applications. Because they are highly stable, nonflammable, and heat resistant, they were used as dielectric fluids in capacitors and transformers, as hydraulic and heat transfer fluids, and as a protective coating for wood products when low flammability was necessary. Between 1930 and 1960, the use of PCBs in "open" systems grew to include such items as paints, inks, carbonless copy papers, plastics, and various industrial fluids (Nat. Acad. Sci. 1979) (Table 2).

In the late 1950s and early 1960s, concern about the biological effects of chlorinated pesticides such as DDT and chlordane led to the development of sophisticated analytical methods to separate and quantify low levels of these compounds in various biological samples. The most accurate method developed to perform this analysis was gas chromatography. This technique involves injecting a very small amount of an environmental sample into a long heated tube packed with a material with different adsorption characteristics for the organic compounds in the sample. The tube is then flushed with an inert gas which forces the compounds at different rates past a detector capable of responding proportionally to the amount of chlorinated compound present in the stream of gas. Temperature, packing material of the tube, rate of gas flow, and the chemical characteristics of the various compounds all play an important role in the time it takes for each compound to be detected (U.S. Environ. Prot. Agency 1979). By comparing the retention times and detector responses of compounds in an environmental sample to those of a known compound, a chemist can identify and quantify the levels of these compounds found in the sample.

TABLE 1. Aroclor products manufactured and distributed in the United States between 1930 and 1977.

Aroclor	% Chlorine
1221	21
1232	32
1016	41
1242	42
1248	48
1254	54
1260	60
1262	62
1268	68

TABLE 2. Domestic uses of PCBs.*

Category	Type of Product	% Total Use
Closed electrical systems	Transformers, capacitors, other (minor) electrical insulating/cooling applications	61 until 1971; 100 after 1971
Nominally closed systems	Hydraulic fluids, heat transfer fluids, lubricants	13 until 1971; 0 after 1971
Open-end applications	Plasticizers, surface coatings, ink and dye carriers, adhesives, pesticide extenders, carbonless copy paper, dyes	26 until 1971; 0 after 1971

*From National Academy of Sciences (1979).

During early use of gas chromatography for pesticide analysis, Dr. Soren Jensen, a Swedish chemist, noted interference of unknown compounds on chromatograms. These compounds seemed to be related to chlorinated pesticides and were originally thought to be by-products of pesticide degradation. In an attempt to identify these compounds, Jensen analyzed eagle feathers which were preserved at the Swedish National Museum of Natural History from 1888 to 1966. He detected the presence of these unknown chlorinated compounds in feathers dating back to 1944, long before the extensive use of chlorinated pesticides. By comparing the chromatograms of the unknown compounds to those of chlorinated compounds in use prior to 1944, Jensen identified the contaminants to be commercial PCBs (Jensen 1966).

Since Jensen's discovery of PCBs in the environment, many investigators have attempted to determine the degree of contamination and/or the health effects caused by this pollutant to fish and wildlife (Holmes et al. 1967, Prest et al. 1970, Ringer et al. 1972, Willford et al. 1981, Schmitt et al. 1983). Risebrough et al. (1968) observed decreased egg hatchability and high chick mortality in peregrine falcons (Falco peregrinus) following the consumption of fish highly contaminated with PCBs. PCBs and several other organic microcontaminants have been implicated in reproductive impairment and/or other biological dysfunctions of wild birds nesting in Green Bay, Lake Michigan (Harris et al. 1985, Heinz et al. 1985). Aulerich et al. (1971) reported reproductive complications and high kit mortality in mink (Mustela vision) that had been fed Great Lakes fish. It was later discovered that high levels of PCBs in those fish were responsible for the previously observed disorders (Ringer et al. 1972, Aulerich et al. 1973).

In 1968, more than 1,200 people in Yusho, Japan developed medical disorders, including excessive mucous discharge from the eyes and chloracne, a form of skin lesion, after consuming rice oil that had been accidentally contaminated with PCBs (Kuratsune 1969, Kuratsune et al. 1972). More recent studies have suggested that polychlorinated dibenzofurans, an extremely toxic compound commonly associated with PCBs, may have contributed to the toxicity observed in the Yusho incident (Rappe et al. 1979, Masuda et al. 1983).

In 1971, after an abundance of publicity regarding the "Yusho" incident, Monsanto voluntarily restricted the sale of their PCB products for use only in "closed" electrical systems (i.e., not in contact with the surrounding environment). Government regulation of PCB use did not occur until 1977, however, when the U.S. Environmental Protection Agency (EPA) restricted PCBs in certain industrial discharges (Federal Register 42FR 6531). In 1978, Section 6(e) of the Toxic Substances Control Act (TSCA) was enacted to specifically regulate the disposal and marking of PCBs (Federal Register 43FR 7150). The TSCA was amended in 1979 to prohibit the manufacture, processing, and distribution of PCBs in commerce except in "closed" systems (i.e., electrical transformers and capacitors with no direct exposure to the surrounding environment) (Federal Register 44FR 31514).

In 1973, governed under Section 406 of the Federal Food, Drug, and Cosmetic Act (FDCA), 21 U.S.C. 346 which authorizes establishment of tolerences for poisonous or deleterious substances added to food that cannot be avoided by good manufacturing practice, the U.S. Food and Drug Administration (FDA) established tolerance levels which limited the allowable PCB concentrations in several commodities, including a maximum of 5 ug/g (parts per million) in the edible portion of fish (Federal Register 38FR 18096). In 1977, after gathering additional information about the potential toxicity of PCBs to humans, the FDA proposed to lower the tolerance level of PCBs in fish and shellfish from 5.0 to 2.0 ug/g (Federal Register 43FR 17847). In 1979, the FDA promulgated a final rule based on this proposal (Federal Register 43FR 38313). As allowed by Section 701(e) of the FDCA, 21 U.S.C. 371(e), the National Fisheries Institute immediately filed an objection to the rule and requested a hearing which required the FDA to prove that, by establishing a lower tolerance, a proper balance between public health and excessive losses of food to American consumers had been found. The request for a hearing automatically stayed the effective date of the final rule, and it was 1984 before the FDA eventually carried out the tolerance level reduction to 2.0 ug/g (Federal Register 49FR 21514).

Monsanto discontinued the production of PCBs in 1977, but approximately 95% of the estimated 1.5 billion lbs originally produced still exists (U.S. Environ. Prot. Agency 1979). The majority of existing PCBs are still in service in "closed" systems such as capacitors and transformers. However, some 500 million lbs of the contaminant remain mobile in the environment (Univ. Wis. Sea Grant 1980). Disposal methods for PCBs range from very effective, but extremely expensive high-temperature incineration to less expensive and less effective methods which continue to release small amounts of PCBs into the aquatic environment. Volatilization of PCBs from landfills or incomplete destruction of PCBs caused by low-temperature incineration may ultimately lead to atmospheric fallout of the contaminant.

Unfortunately, aquatic ecosystems are the ultimate sink for PCBs and many other organic contaminants. Upon entering the aquatic environment, PCBs adhere to suspended particulate matter and bottom sediments because of their extremely low solubility in water (Crump-Wiesner et al. 1973). Polluted sediments, acting as a huge reservoir of contaminants, pose a potential threat as a long-term source of PCBs to the aquatic ecosystem (Hammond et al. 1972). Any disturbance of contaminated sediments (i.e., increased flow, wave activity, dredging) will cause the PCBs to be resuspended in the water column where they are available to the biota. Also, PCBs are directly available to the biota through benthic food pathways.

Although contamination by several toxic compounds has been documented in the sediments and water columns of all of the Laurentian Great Lakes, an overall decrease of PCBs in the Lake Michigan basin has been observed in recent years and can be attributed to the strict regulatory decisions of the late 1970s. Recent data show that PCB concentrations range from 0.06-22.00 ug/g in sediments in the Wisconsin coastal zone of Lake Michigan (Pariso et al. 1984), while water column concentrations average 1.8 ng/L (parts per trillion) in the main basin of Lake Michigan and 3.5 ng/L in Green Bay (Swackhamer and Armstrong, n.d.).

Contamination of aquatic ecosystems threatens the health of aquatic organisms and humans because chlorinated hydrocarbons bioaccumulate in high trophic level organisms, such as game fish, which may be consumed by humans. Bioaccumulation is the uptake and retention of pollutants from the environment by organisms via any mechanism or pathway (Connell and Miller 1984). Bioaccumulation processes include population fluctuations, food web relationships, species metabolic capabilities, and other ecological considerations. Also, the physicochemical properties of lipophilicity, low water solubility, and high stability of chlorinated hydrocarbons play a major role in bioaccumulation.

Fish can uptake PCBs directly from water as it is passed over their gills (bioconcentration). Snarski and Puglisi (1976) found brook trout (scientific names appear in Append. A) can accumulate Aroclor 1254 at levels 8,000-25,000 times above the ambient water concentrations. However, direct uptake is not totally responsible for the high levels of PCBs found in adult Lake Michigan fish. Weininger (1978) found that direct uptake only accounted for 2-3% of the total observed PCB accumulation in adult lake trout, although this route was more important for juvenile fish which had not yet become predominantly piscivorous.

The primary source of PCBs for Lake Michigan fish is their diet (biomagnification). Weininger and Armstrong (1980) described food chain bioaccumulation via two primary pathways in fish. The first pathway is pelagic: water→phytoplankton and suspended particulates→zooplankton→macroinvertebrates→forage fish→piscivorous fish. As future sedimentation of PCBs in the Lake Michigan water column occurs, the pelagic pathway is expected to decrease in importance as a major pathway of bioaccumulation. The second pathway is benthic: water→particulate matter→sediment→benthic invertebrates→forage fish→piscivorous fish. Although PCBs gradually volatilize, biodegrade, and flush out, the sediments of Lake Michigan will continue to be a PCB reservoir for years to come, increasing the importance of the benthic pathway.

State and federal natural resource agencies have monitored the degree of contamination by chlorinated hydrocarbons in Lake Michigan fishes since the late 1960s. An overall decline in PCB concentrations has occurred, although differences among various species and regions of Lake Michigan have been evident (DeVault 1984). DeVault et al. (1985) reported that mean PCB concentrations in Lake Michigan lake trout increased from 12.86 ug/g in 1972 to 22.91 ug/g in 1974, then declined to 6.49 ug/g in 1981. Several other studies have shown similar results in other Lake Michigan fishes (Straub and Sprafka 1982; Rogers and Swain 1983; St. Amant et al. 1983, 1984; Schmitt et al. 1983, 1985).

Numerous studies have been carried out to determine the toxicity of PCBs to fish (Stalling and Mayer 1972, Gruger et al. 1976, Melancon and Lech 1976, Mayer et al. 1985). The toxicity of PCBs is greatest during the early life stages of fish (Mauck et al. 1978) and may contribute to the lack of natural reproduction of lake trout in Lake Michigan (Willford et al. 1981). PCBs may also suppress the immune responses of fish, increasing their susceptibility to disease (Couch 1975, Snarski and Puglisi 1976).

Toxicological studies have not directly linked human health problems with the ingestion of PCB-contaminated fish, but some studies with nonhuman primates have shown significant deleterious health effects. Allen et al. (1974) fed female rhesus monkeys (Macaca mullata) a diet containing 25.00 ug/g of Aroclor 1248 for two months. There were no significant changes in the control group (non-PCB diet) while the monkeys in the test group (PCB diet) developed numerous skin lesions, anemia, loss of facial hair, and bone marrow hypoplasia. More recent studies with low-level PCB concentrations (2.5-5.0 ug/g) have shown that infants born to the test monkeys received PCBs through breast milk and displayed hair loss, facial acne, and edema (Allen 1975, Bowman et al. 1978, Allen et al. 1979). Behavioral and learning disabilities were also prominent and mortality rates were higher for infants of the test group as compared to the control group.

The overall lack of conclusive knowledge of PCB toxicity to humans has prompted state agencies to establish health advisories that suggest humans should limit their consumption of highly contaminated fish. These advisories also suggest that young children and pregnant or lactating women should eliminate contaminated fish from their diet altogether. The Wisconsin Department of Natural Resources (DNR), in conjunction with the state's Department of Health and Social Services, annually issues a fish consumption advisory based on data from a statewide fish contaminant monitoring program.

A serious effect of contamination in the Great Lakes is the diminished value of the lakes as a natural resource, especially in the production of fish suitable for human consumption (Delfino 1979). The Lake Michigan commercial fishery, currently valued at approximately $3.4 million in Wisconsin (Bishop 1984), has been adversely affected by the effects of widespread contamination. Areas such as lower Green Bay have been closed to commercial fishing for certain species because of severe PCB contamination while elevated dieldrin concentrations in bloater chubs have resulted in heavy fines and product seizures. This has resulted in a lower demand for chubs on the commercial market and revenue losses for commercial chub fishermen and wholesale merchants.

The Lake Michigan sport fishery, with an estimated value of $60 million in Wisconsin (Bishop 1984), has also been adversely affected by PCB contamination. A strict lake trout consumption advisory released in August 1984 probably contributed to a subsequent decline in charter boat angler effort and to decreased lake trout harvest in 1984 and 1985 compared to 1983 (Michael J. Hansen, Wis. Dep. Nat. Resour., pers. comm. 1986). Sales of fishing tackle and supplies for coastal marinas and sport shops probably suffered a similar setback at this time.

Negative publicity of fish consumption advisories leads to other more subtle consequences for the commercial and sport fishing industries such as stressed relations between commercial and sport fishing organizations and state regulatory agencies such as DNR. To avoid a reoccurrence of such problems, DNR contacted several Lake Michigan sport fishing organizations in early 1985 and proposed a joint effort to determine patterns of PCB contamination in Lake Michigan salmonids. Strong support was given to this program as Lake Michigan anglers agreed to donate a portion of their 1985 salmonid catch for use as samples in this study.

STUDY AREA

Lake Michigan is the only Laurentian Great Lake completely within the United States and is third among the lakes in total surface area with nearly 58,200 km^2 and an average depth of 84 m (276 ft). Wisconsin's jurisdiction encompasses 19,133 km^2 including 800 km of shoreline. A detailed description of the lake appears in Wells and McLain (1973).

The lake is divided into two basins and Green Bay (Fig. 1). In Wisconsin, the southern basin extends from Sheboygan south to Kenosha and is characterized by a relatively smooth, unbroken shoreline and a gradually sloping lake bottom that reaches a maximum depth of 170 m. Major tributary streams important to anadromous salmonids include the Sheboygan, Milwaukee, and Root rivers.

The northern lake basin in Wisconsin stretches from Washington Island at the tip of Door County to the town of Cleveland in Sheboygan County. In contrast to the southern basin, the northern basin has a relatively rocky, irregular shoreline and a steeply sloping lake bottom that reaches a maximum depth of 281 m. Reibolts, Heins, and Hibbards creeks are a few of the small tributary streams found along the Door County shoreline. Major tributaries include the Ahnapee, Kewaunee, East and West Twin, and Manitowoc rivers.

Green Bay in Wisconsin extends from Washington Island southwest to Marinette and south to the city of Green Bay. Green Bay is relatively shallow with a maximum depth of 33 m and it generally has warmer, more productive waters than the rest of Lake Michigan. The salmonid fishery is limited to the upper bay by warm water in the lower bay. Major tributary streams include the Little, Menominee, Oconto, and Peshtigo rivers.

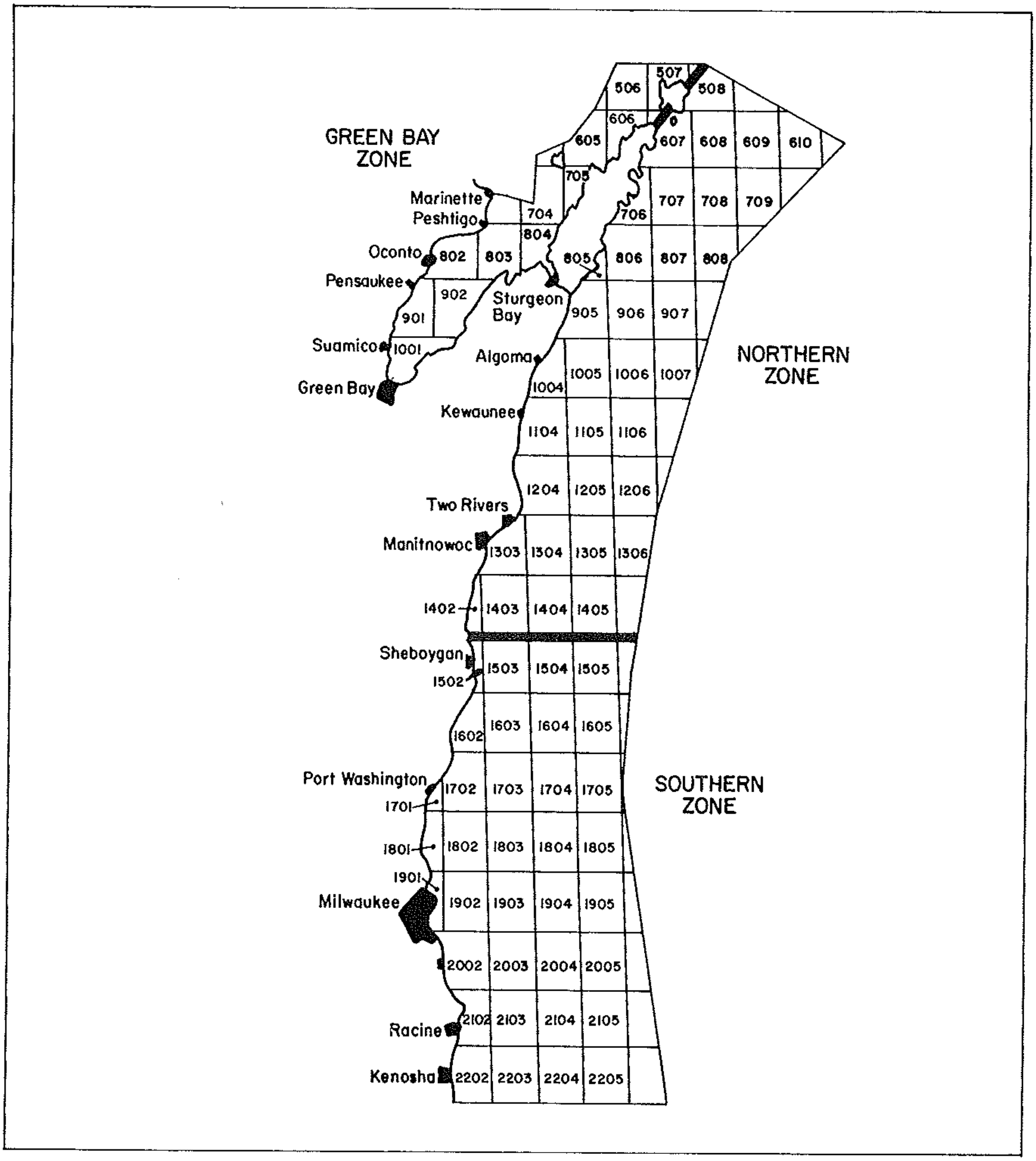

FIGURE 1. The Wisconsin waters of Lake Michigan, showing the major zones used to compare PCB concentrations in Lake Michigan salmonids.

METHODS

Fish Collection

The majority of fish samples were donated by Lake Michigan anglers at organized fishing contests in several coastal cities, at DNR field offices, and at various sport shops and marinas along the lakeshore acting as authorized collection sites. In areas where angler donations were minimal, DNR personnel collected fish by trap nets, gill nets, and electrofishing. Individual fish were measured in the field for weight and length, wrapped in aluminum foil and frozen whole at -10 C before shipment to the laboratory for processing and analysis.

Sample Preparation

Prior to processing, the sex, fin clip, tag information, and stomach contents of each fish were recorded. Several samples were donated by a University of Wisconsin research team studying parasite community structure of salmonids and their prey. Sample processing for that study required removal of the stomachs of the fish; therefore, weight and stomach contents were not available for these fish. Edible portions of individual fish were prepared according to Section 141.12c of the FDA Pesticide Analytical Manual (McMahon 1968). This included the removal of the head, tail, fins, viscera, and bones from each sample. Each skin-on fillet was then ground in a Hobart commercial meat grinder (Model 4332 for fish 43 cm and longer and Model 4141 for fish shorter than 43 cm. After further mixing by hand, a random 118-ml subsample was put into a glass jar with aluminum foil-lined screw cap and stored at -10 C until analysis.

Laboratory Analysis

All chemical analyses were performed by the Organic Chemistry Unit of the Wisconsin State Laboratory of Hygiene (SLH) in Madison. Each fish sample was analyzed for PCBs and percent fat at a cost of $82.50 per sample. Several samples were also analyzed for the pesticides dieldrin and chlordane to maintain an annual trend monitoring data base. Total analytical costs for the project were approximately $80,000.

Frozen fish tissues were thawed and ground with dry ice in a high speed blender to produce a free-flowing powder. After sublimation of the dry ice, 10 g fish tissue were mixed with 60 g anhydrous Na_2SO_4. The fish tissue and Na_2SO_4 mixture was extracted in a 20 mm I.D. chromatographic column with 200 ml of dichloromethane at an elution rate of 5 ml/min. After the solvent had completely eluted, the extract was concentrated to 5 ml under a gentle stream of filtered air or by rotoevaporation. Next, the sample was transferred to a 10-ml volumetric flask and 5 ml of 1:1 dichloromethane-cyclohexane was added.

Lipid Determination

A 2-ml aliquot of solvent was placed in a pre-tared aluminum weighing dish and evaporated under a gentle stream of filtered air. After weighing the residue to the nearest 0.1 mg, fat concentration was determined using the equation: % fat = (residue + dish weight - tare) x 100/sample weight.

Gel Permeation Chromatography

Automated gel permeation chromatography (GPC) was used to separate the PCBs from the lipids in the extract. A 60-g bed of SX-3 Biobeads gel resin (Bio Rad, Richmond, California) was used in a solvent system of 1:1 cyclohexane in dichloromethane. The resin was packed in a 2.5 cm I.D. x 48 cm glass column fitted with two adjustable end plungers (Glenco Scientific, Inc., Houston, Texas). The column was placed on an automated low-pressure GPC Autoprep 1001 chromatography unit (ABC Labs, Inc., Columbia, Missouri) and the GPC solvent was pumped through at a rate of 5 ml/minute. Five milliliters (but not more than 1 g of lipids) of sample extract was placed on the GPC column. The first 140 ml were discarded and the next 140 ml were collected in a 250-ml beaker.

Silica Gel Adsorption Chromatography

The GPC eluates were concentrated to 5 ml under a gentle stream of filtered air and then subjected to silica gel adsorption chromatography to separate PCBs from most other chlorinated pesticides. Silica gel columns (1 cm I.D. x 30 cm) were prepared by filling with hexane, adding a 1-cm layer of anhydrous Na_2SO_4 and a 5-g layer of 3% H_2O deactivated silica gel and topping off the column with an additional 1-cm layer of anhydrous Na_2SO_4. The concentrated 5-ml GPC eluate was added to the prepared silica gel column and the column was eluated with 50 ml of hexane. The resulting eluate was collected for quantification by gas chromatography.

Gas Chromatography

Analysis of fish tissue samples was performed by using gas chromatographs equipped with a ^{63}Ni electron-capture detector. A 1.8 m x 4 mm I.D. glass column packed with 4% SE-30 and 6% OV-210 liquid phase was used. The column temperature was maintained at 225 C and a detector temperature of 300 C was used. The carrier gas was 90% argon/10% methane at a flow rate of 40 ml/min. The peak height method of summing as many peaks from the sample chromatogram as matched corresponding peaks in the appropriate Aroclor PCB-standard chromatogram was used for quantification.

Quality Control

With each group of 9 samples, 1 sample was fortified with a known quantity of a single Aroclor and 1 sample was analyzed in duplicate. The recovery of the fortified Aroclors ranged 80-110%. The replicate analysis was within 7% of the average replicate analysis for each Aroclor found.

Data Analysis

To facilitate the analysis of seasonal variation, the following seasons were established: spring, March-May; summer, June-August; and autumn, September-November. The three previously described lake basins were used to analyze for zonal variation.

Statistical analyses were performed using the SAS Version 5.08 computer program (SAS Institute Inc. 1985a, b). Statistics based on fewer than 5 samples from any zone and/or season were not included in any further analyses. For purposes of my analysis, fish samples with PCB residues below the quantifiable limit of 0.20 ug/g were assigned a value of 0.10 ug/g. The level of significance used for all statistical analyses was $P \leq 0.05$.

Linear regression, using PCB as the dependent variable, was used to test the hypothesis that PCB concentration was significantly related to length. PCB concentrations in lake trout samples were normalized by log-transformation prior to analysis, whereas data from all other species were analyzed untransformed. The relationship between mean PCB concentration and length, in conjunction with the 95% confidence limits for the mean concentration, were used to predict the size of fish that were above, at, and below a mean concentration of 2.0 ug/g of the contaminant (Append. B) (Snedecor and Cochran 1967). Analysis of covariance (ANCOVA) was used to examine spatial and/or temporal variation in the PCB-length relationship.

RESULTS

For each of 791 samples representing 8 species, data included species, sample location, collection date, length, weight, PCB concentration, and lipid content (Append. C).

Pink Salmon

A total of 5 pink salmon were analyzed and were found to have an average PCB concentration of 0.22 ug/g ($\pm$0.05) in their fillets. Four of the 5 were collected in the Oconto River during the fall spawning season and 1 sample was collected off Sheboygan in August.

Brook Trout

Small numbers of brook trout were collected in all three lake zones. Brook trout collected from the Sheboygan River had relatively higher average PCB concentrations than those collected from the southern zone, although their mean concentrations were not significantly different. There were no brook trout from the southern zone that exceeded 2.0 ug/g whereas 8 of 18 brook trout from the Sheboygan River exceeded 2.0 ug/g. Therefore, brook trout from the Sheboygan River were excluded from further analysis.

There were adequate numbers of brook trout from the three zones to examine spatial variation in PCB concentration; however, there were too few to accurately examine seasonal variation (Table 3). The average PCB concentration of brook trout varied between zones (P=0.0001). PCB concentrations in brook trout from Green Bay were higher than those from the northern zone (P=0.0001), but were not higher than those from the southern zone (Sheboygan River excluded), whereas those from the northern zone were less than those from the southern zone (P=0.0005).

Green Bay brook trout exhibited a significant linear relationship between PCB concentration and their length (P=0.0029; r^2=0.79; Y=0.32X - 2.89) (Fig. 2). The size of a fish containing 2.0 ug/g of PCB was approximately 38.5 cm (15.2 inches). Brook trout from the northern zone also had a significant linear relationship between PCB and length (P=0.0032; r^2=0.45; Y=0.10X - 0.77) although no brook trout caught in the northern zone exceeded 2.0 ug/g at any length (Fig. 3). There was no relationship between PCB and length for southern zone brook trout, possibly attributable to small sample size; all fish sampled were below 2.0 ug/g (Fig. 4).

Rainbow Trout

Rainbow trout from the Sheboygan River contained higher levels of PCBs than those from the southern zone (P=0.0013) and were not analyzed any further. There was a significant difference in average PCB concentrations between zones (P=0.0001), as rainbow trout from Green Bay had higher PCB than those from both northern and southern zones (P=0.0003, P=0.0001, respectively) (Table 4). Conversely, PCB levels in rainbow trout from northern and southern zones were similar and were combined into the main lake basin.

TABLE 3. Mean PCB concentrations (ug/g) in Lake Michigan brook trout, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Green Bay		8	1.30	0.34
	Spring	3	2.27	0.59
	Summer	4	0.75	0.09
	Autumn	1	0.60	--
Northern		17	0.74	0.07
	Spring	3	0.54	0.10
	Summer	12	0.96	0.11
	Autumn	2	0.32	0.06
Southern		7	1.01	0.17
	Spring	2	0.44	0.34
	Summer	5	1.23	0.80
	Autumn	--*	--	--
Sheboygan River		18	1.84	0.26
	Spring	--	--	--
	Summer	11	1.51	0.24
	Autumn	7	2.36	0.51

* No samples collected.

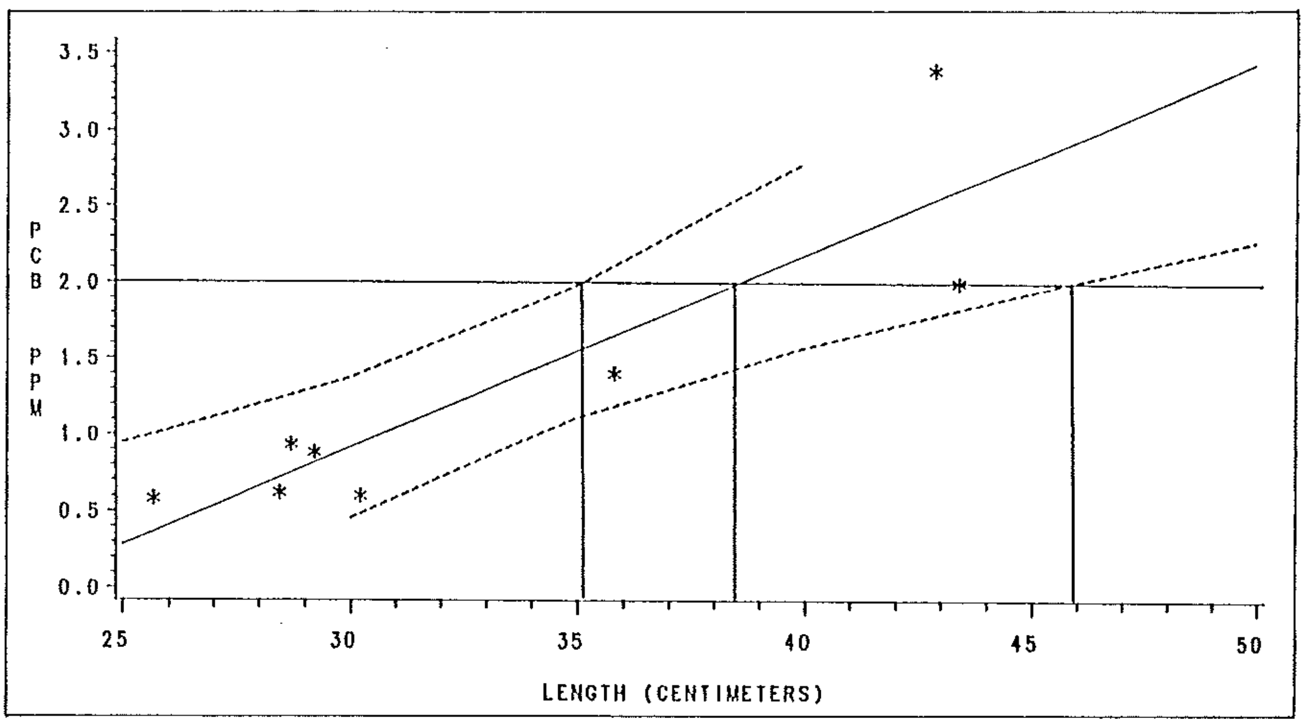

FIGURE 2. Plot of PCB concentrations vs. length with line of best fit and 95% confidence limits for brook trout from the Green Bay zone.

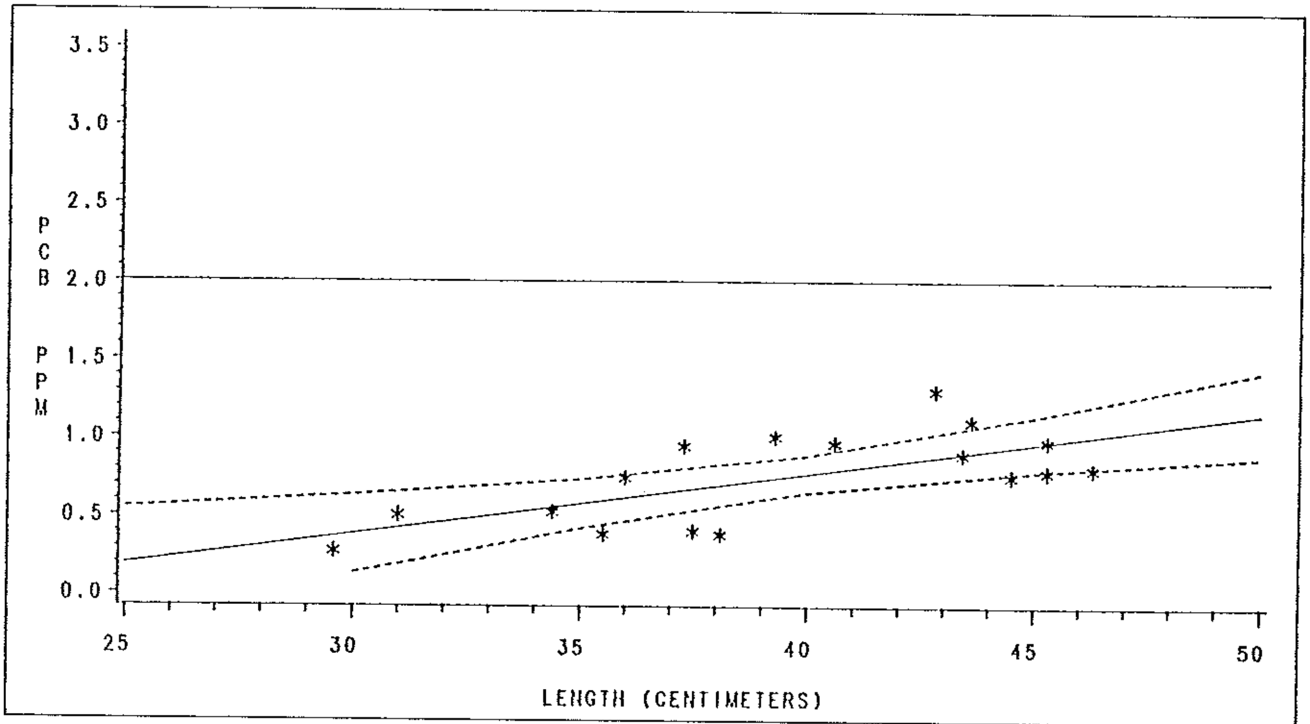

FIGURE 3. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for brook trout from the northern zone of Lake Michigan.

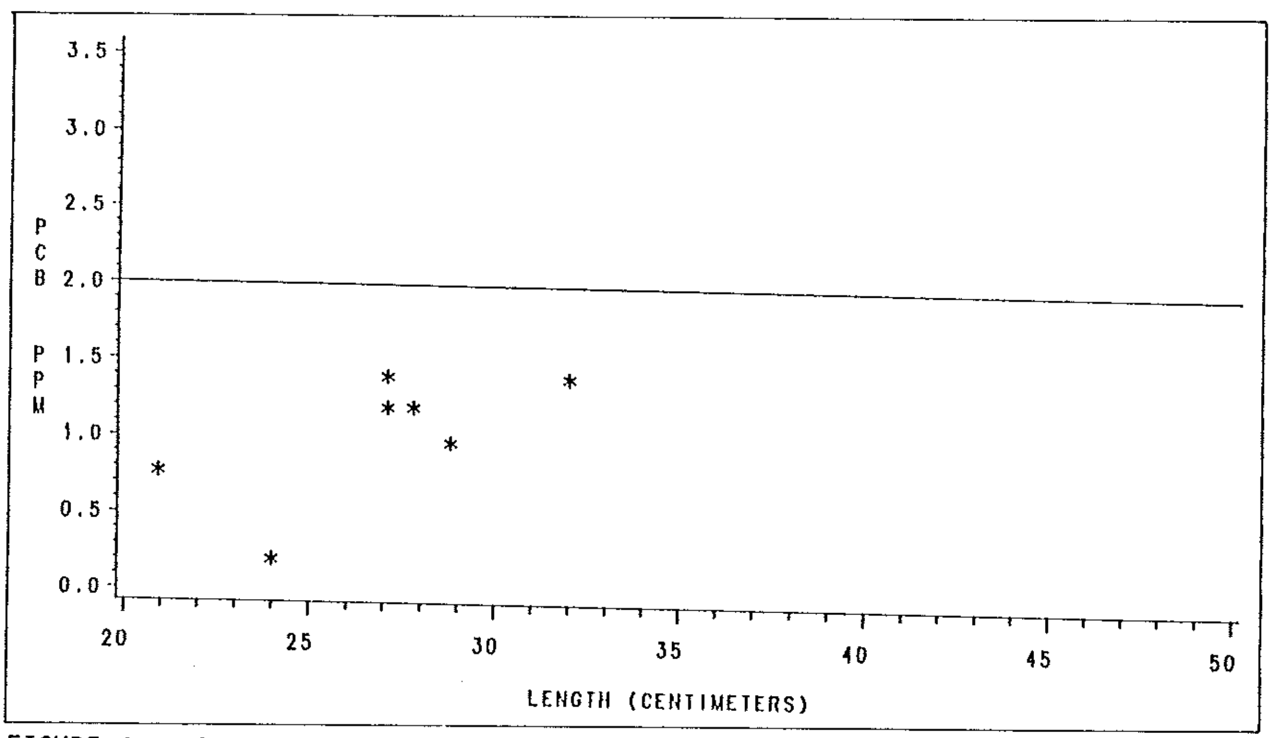

FIGURE 4. Plot of PCB concentration vs. length for brook trout from the southern zone of Lake Michigan.

TABLE 4. Mean PCB concentrations (ug/g) in Lake Michigan rainbow trout, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Green Bay		15	1.72	0.30
	Spring	--*	--	--
	Summer	2	1.80	0.40
	Autumn	13	1.70	0.34
Northern		14	0.72	0.14
	Spring	8	0.56	0.09
	Summer	6	0.94	0.30
	Autumn	--	--	--
Southern		20	0.61	0.09
	Spring	--	--	--
	Summer	7	0.78	0.20
	Autumn	13	0.51	0.09
Main Lake Basin		34	0.65	0.08
	Spring	8	0.56	0.09
	Summer	13	0.85	0.17
	Autumn	13	0.51	0.09
Sheboygan River		12	2.34	0.48
	Spring	--	--	--
	Summer	6	3.60	0.48
	Autumn	6	1.09	0.38

* No samples collected.

Analysis of seasonal variation was limited to autumn because of small sample sizes from spring and summer in Green Bay. Green Bay rainbow trout had higher autumn PCB concentrations than those from the main lake basin ($\underline{P}$=0.0021).

Rainbow trout from Green Bay had a significant relationship between PCB concentration and length ($\underline{P}$=0.0029; r^2=0.44; Y=0.13X - 0.93) and reached 2.0 ug/g of PCB at a length of 55.4 cm (21.8 inches) (Fig. 5). Conversely, rainbow trout from the main lake basin did not have a significant relationship between PCB concentration and length, but were all below 2.0 ug/g PCB (Fig. 6).

Splake

Splake have been stocked in western Green Bay near Marinette since 1983 to add diversity to the existing salmonid fishery. Many of these fish have remained adjacent to the study area and thus, the collection of this species was limited to the Green Bay zone (Table 5).

There was no evidence of seasonal variation between spring and summer samples, but the PCB-length relationship was significant ($\underline{P}$=0.0001; r^2=0.61; Y=0.24X - 1.80) (Fig. 7). Splake reached 2.0 ug/g of PCB at a length of 40.4 cm (15.9 inches) in Green Bay.

Coho Salmon

All coho salmon collected were from the southern zone with the exception of 10 samples analyzed from the northern zone (Table 6). Autumn samples were all prespawn fish collected in the Sheboygan River.

Average PCB concentrations of coho salmon were similar between the northern and southern zones and between the autumn and summer seasons. The PCB-length relationship was significant for coho salmon ($\underline{P}$=0.0001; r^2=0.22; Y=0.08X - 0.84), though no fish caught would likely exceed an average concentration of 2.0 ug/g PCB (Fig. 8).

Lake Trout

Collection of lake trout was also limited to the northern and southern zones (Table 7) since stocking of lake trout in Green Bay was discontinued in 1979 and few are caught there. Average PCB residues in samples collected from the northern and southern zones were similar so the data were combined.

Seasonal variation within the main lake basin was evident, as spring-caught lake trout contained higher concentrations of PCBs than those caught in either summer or autumn ($\underline{P}$ = 0.0001 for both). Summer-caught lake trout also contained higher levels of PCBs than autumn-caught fish ($\underline{P}$ = 0.0113).

There was a significant relationship between PCB concentration and length ($\underline{P}$ = 0.0001; r^2= 0.86; Y = 0.06X - 1.16) for lake trout. Lake trout reached 2.0 ug/g of PCB at a length of 58.0 cm (22.8 inches) (Fig. 9).

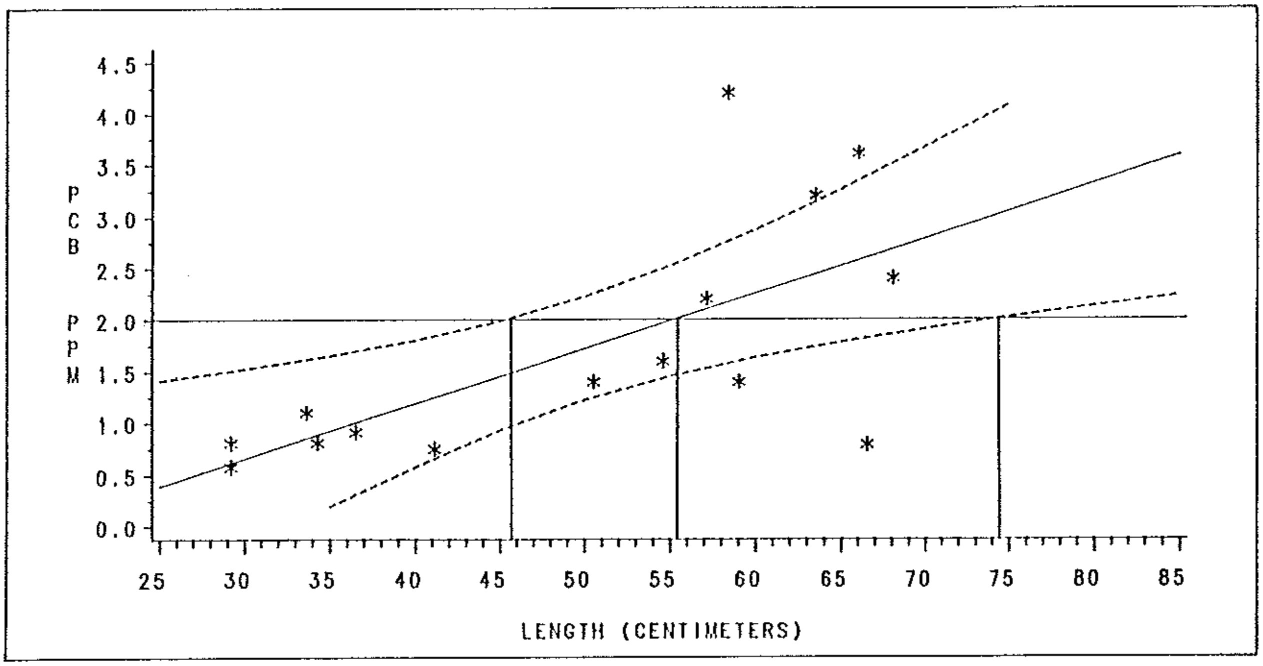

FIGURE 5. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for rainbow trout from the Green Bay zone.

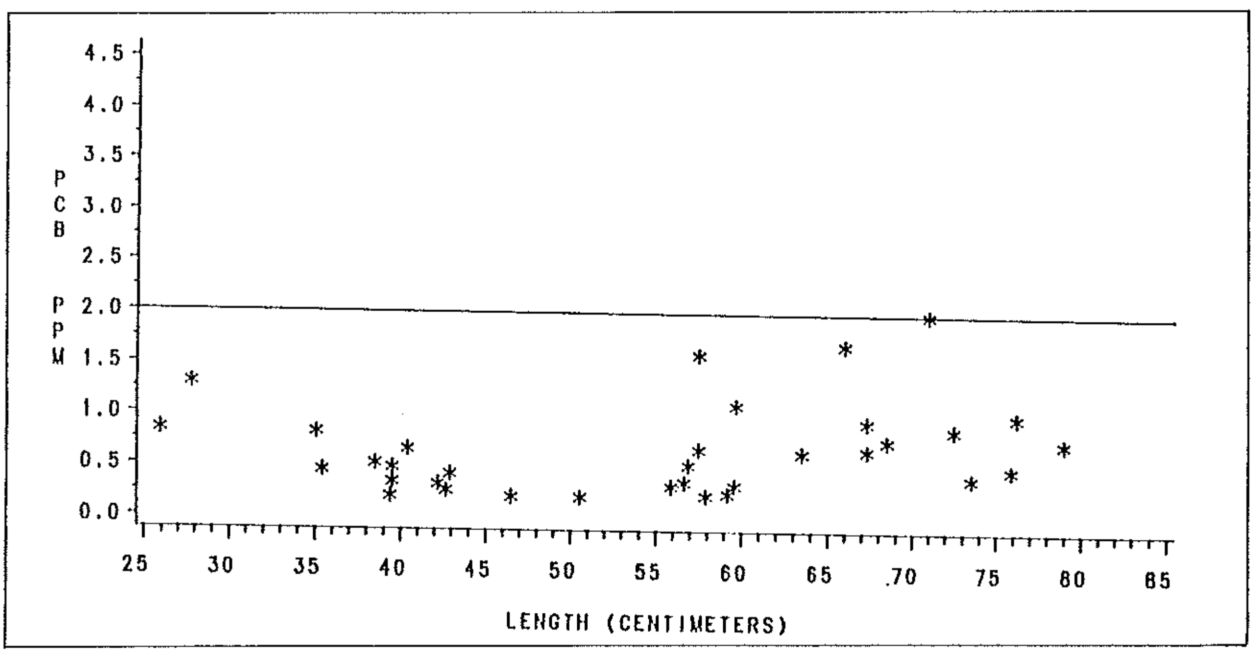

FIGURE 6. Plot of PCB concentration vs. length for rainbow trout from the main lake basin of Lake Michigan.

TABLE 5. Mean PCB concentrations (ug/g) in Green Bay splake, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Green Bay		63	2.00	0.11
	Spring	29	2.16	0.10
	Summer	34	1.86	0.18
	Autumn	--*	--	--

* No samples collected.

TABLE 6. Mean PCB concentrations (ug/g) in Lake Michigan coho salmon, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Northern		10	0.83	0.12
	Spring	--*	--	--
	Summer	10	0.83	0.12
	Autumn	--	--	--
Southern		58	0.88	0.08
	Spring	2	0.86	0.44
	Summer	27	1.07	0.12
	Autumn	29	0.70	0.10
Main Lake Basin		69	0.87	0.07
	Spring	2	0.86	0.44
	Summer	37	1.00	0.10
	Autumn	30	0.75	0.10

* No samples collected.

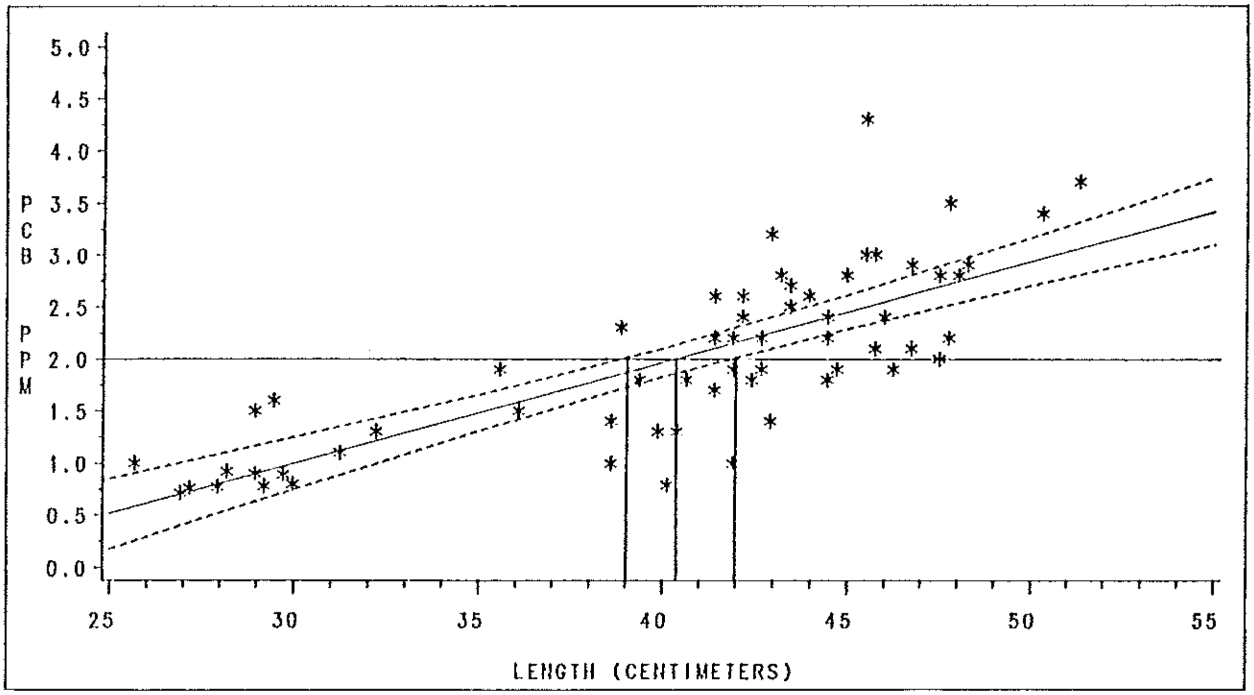

FIGURE 7. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for splake from the Green Bay zone.

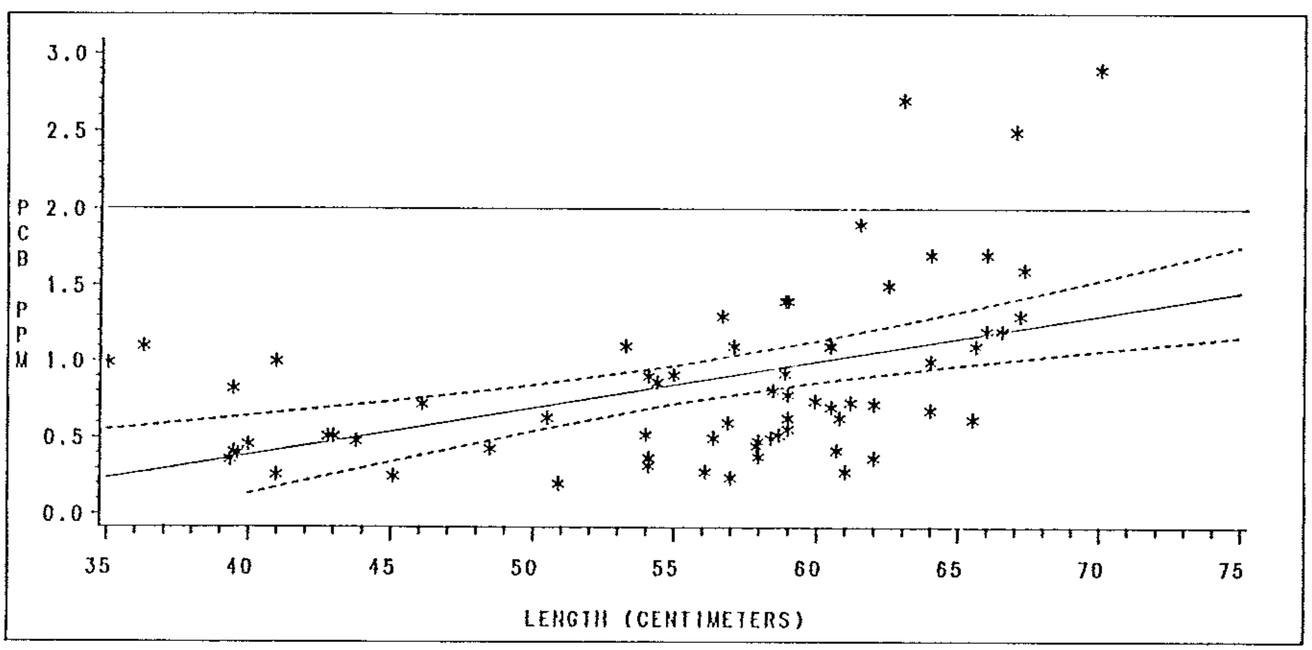

FIGURE 8. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for coho salmon from the main lake basin of Lake Michigan.

Brown Trout

Mean PCB levels in brown trout collected from the Sheboygan River were not different than those collected from the southern zone (Table 8). However, brown trout from the Sheboygan River had a negative relationship between PCB and length compared to a positive relationship for those from the remainder of the southern zone. The negative PCB-length relationship was due to high PCB levels in small fish that were collected from the Sheboygan harbor area prior to their entering the open water of Lake Michigan. Therefore, brown trout from the Sheboygan River were not representative of those from the southern zone and were excluded from further analyses.

Green Bay brown trout had significantly higher PCB concentrations than both the northern and southern zones (P=0.0001 for each), whereas brown trout from the northern and southern zones were not significantly different in their average PCB concentrations. Consequently, the northern and southern zones were pooled.

Green Bay brown trout had higher PCB levels than in the main lake basin in all three seasons (spring P=0.0001; summer P=0.0023; autumn P=0.0166). Green Bay brown trout also had significant seasonal variation in their PCB concentrations (P=0.0001). PCB levels were higher in the spring than in the summer (P=0.0255) or autumn seasons (P=0.0001). However, mean PCB levels in summer and autumn brown trout were not different. Brown trout from the main lake basin did not vary seasonally.

The concentration of PCBs in brown trout from Green Bay increased with length (P=0.0001; r^2=0.35; Y=0.19X - 0.90), reaching 2.0 ug/g of PCB at a length of 39.2 cm (15.4 inches) (Fig. 10). Brown trout from the main lake basin also exhibited a significant relationship between PCB concentration and length (P=0.0017; r^2=0.11; Y=0.10X - 0.04), reaching 2.0 ug/g of PCB at a length of 53.0 cm (20.9 inches) (Fig. 11).

Chinook Salmon

Chinook salmon were collected from each of the three lake zones, although seasonal analysis was limited to summer and autumn due to the collection of only 1 spring sample (Table 9). Chinook salmon collected from the Sheboygan River during the fall spawning run were combined with samples from the southern zone.

There was a significant difference in average PCB concentrations between zones (P=0.0249). PCB levels in chinook salmon from Green Bay were not higher than those from either lake zone, whereas those from the northern zone were higher than from the southern zone (P=0.0439).

Chinook salmon caught in summer had lower PCB concentrations than those caught in autumn within all three zones (Green Bay P=0.0264; northern P=0.0330; southern P=0.0004). Seasonal variation was also significant between zones as chinook salmon from the northern zone had higher PCB concentrations than those from the southern zone in summer.

Chinook salmon from all three zones had significant PCB-length relationships (P=0.0001; Green Bay r^2=0.72, Y=0.09X - 81; northern r^2=0.68, Y=0.12X - 1.63; southern r^2=0.65, Y=0.10X - 1.20) reaching 2.0 ug/g PCB at 78.3 cm (Fig. 12) in Green Bay, 75.0 cm (Fig. 13) in the northern zone, and 83.5 cm (Fig. 14) in the southern zone.

TABLE 7. Mean PCB concentrations (ug/g) in Lake Michigan lake trout, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Northern		65	3.16	0.41
	Spring	7	9.00	2.14
	Summer	37	2.01	0.38
	Autumn	21	3.24	0.29
Southern		82	4.03	0.33
	Spring	1	0.62	--
	Summer	80	4.10	0.34
	Autumn	1	2.00	--
Main Lake Basin		147	3.64	0.26
	Spring	8	7.96	2.13
	Summer	117	3.44	0.27
	Autumn	22	3.18	0.28

TABLE 8. Mean PCB concentrations (ug/g) in Lake Michigan brown trout, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Green Bay		87	2.48	0.16
	Spring	18	3.14	0.30
	Summer	27	2.55	0.27
	Autumn	42	2.15	0.23
Northern		43	1.94	0.19
	Spring	18	2.09	0.35
	Summer	17	2.08	0.28
	Autumn	8	1.31	0.24
Southern		42	2.09	0.12
	Spring	4	2.42	0.54
	Summer	37	2.05	0.13
	Autumn	1	2.20	--
Main Lake Basin		85	2.01	0.11
	Spring	22	2.15	0.30
	Summer	54	2.06	0.12
	Autumn	9	1.41	0.24
Sheboygan River		13	2.48	0.19
	Spring	--*	--	--
	Summer	4	2.65	0.30
	Autumn	9	2.40	0.25

* No samples collected.

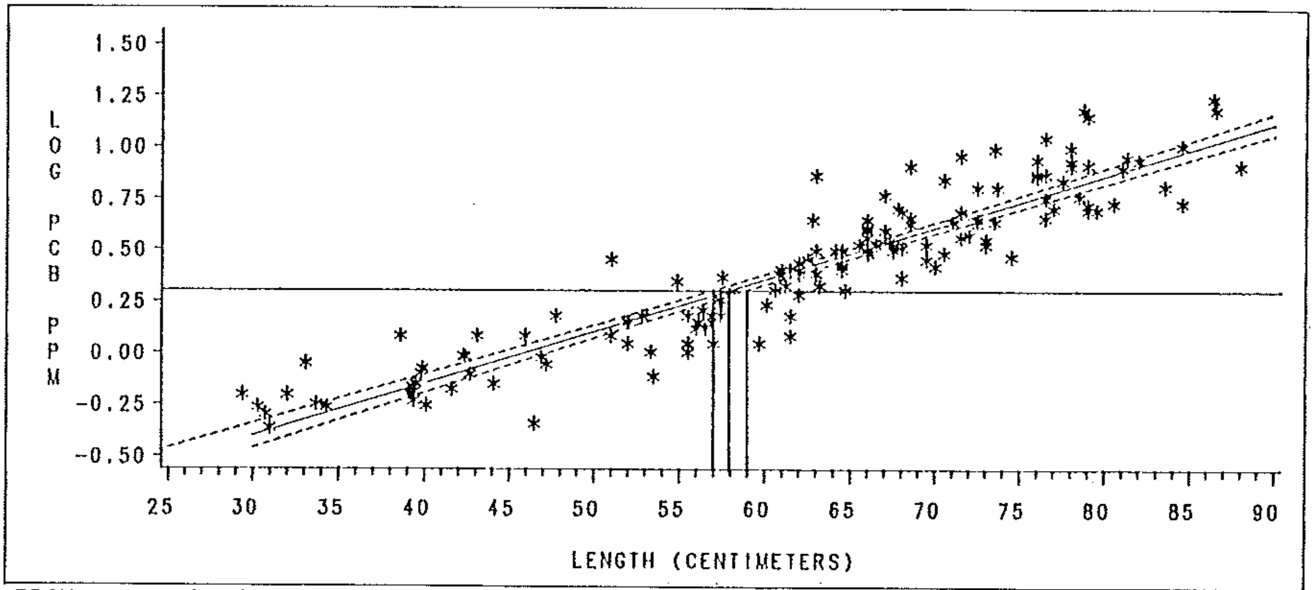

FIGURE 9. Semi-log plot of PCB concentration vs. length with line of best fit and 95% confidence limits for lake trout from the main lake basin of Lake Michigan.

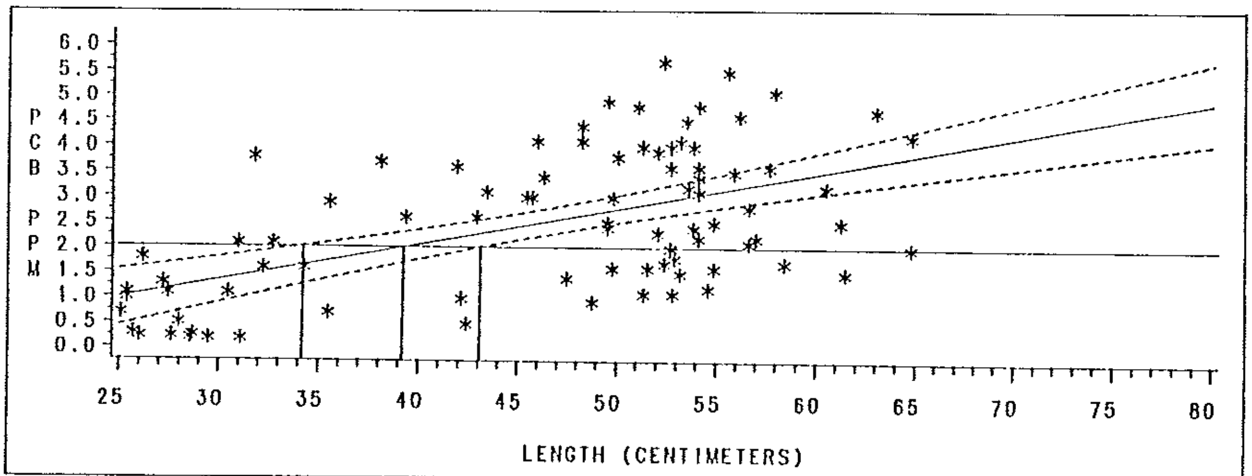

FIGURE 10. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for brown trout from the Green Bay zone.

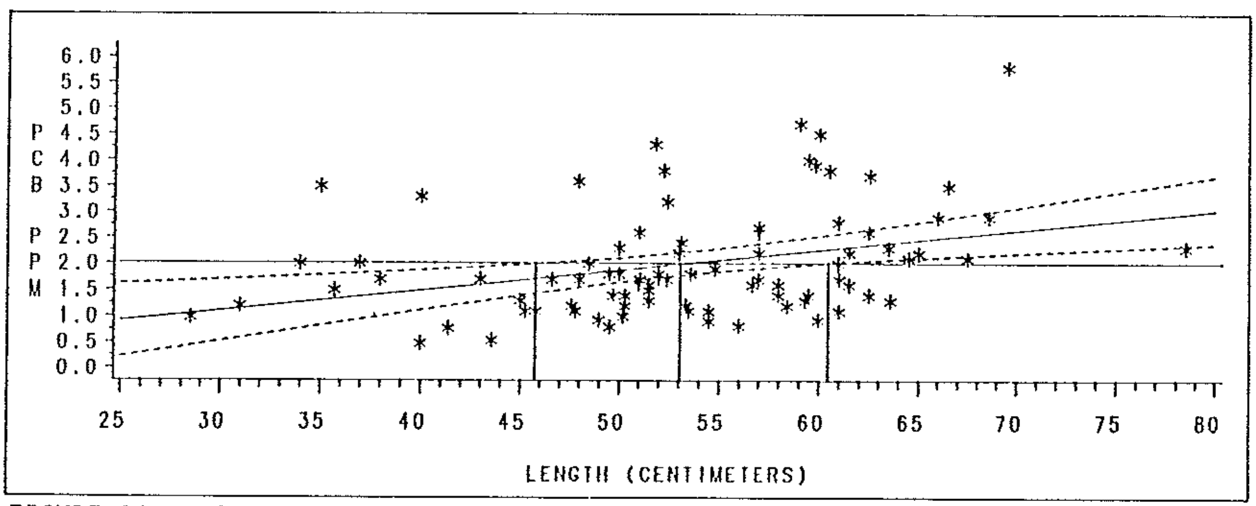

FIGURE 11. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for brown trout from the main lake basin of Lake Michigan.

TABLE 9. Mean PCB concentrations (ug/g) in Lake Michigan chinook salmon, 1985.

Lake Zone	Season	No. Samples	PCB Mean	+ 1 S.E.
Green Bay		27	1.46	0.12
	Spring	--*	--	--
	Summer	6	0.82	0.31
	Autumn	21	1.65	0.09
Northern		61	1.45	0.14
	Spring	1	1.40	--
	Summer	45	1.39	0.18
	Autumn	15	1.66	0.14
Southern		120	1.10	0.08
	Spring	--	--	--
	Summer	93	0.87	0.08
	Autumn	27	1.90	0.18

* No samples collected.

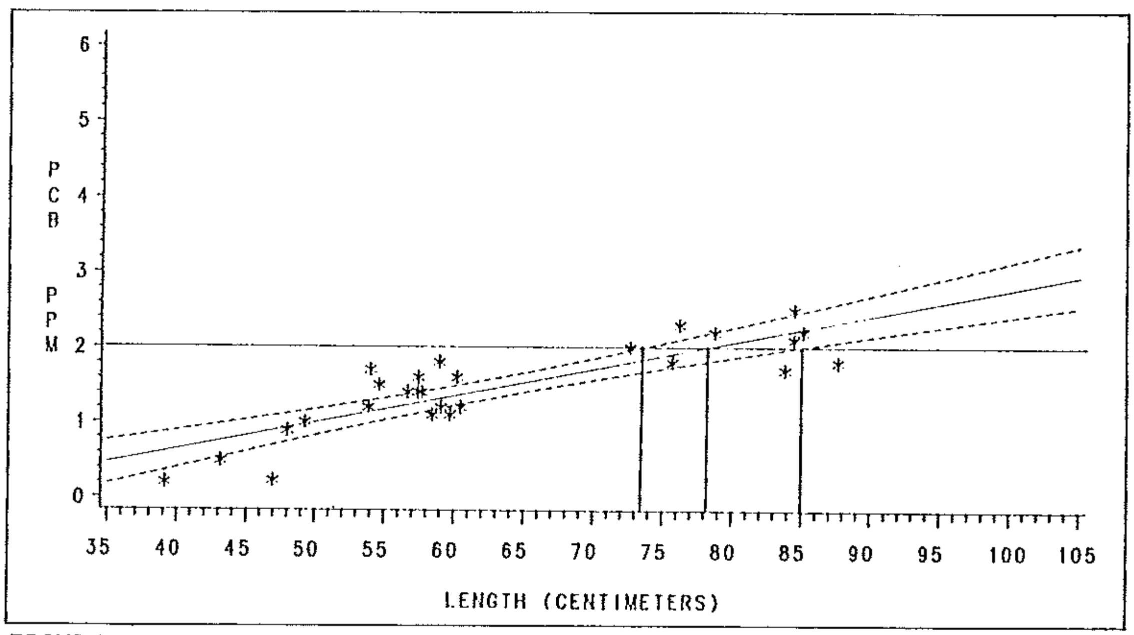

FIGURE 12. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for chinook salmon from the Green Bay zone.

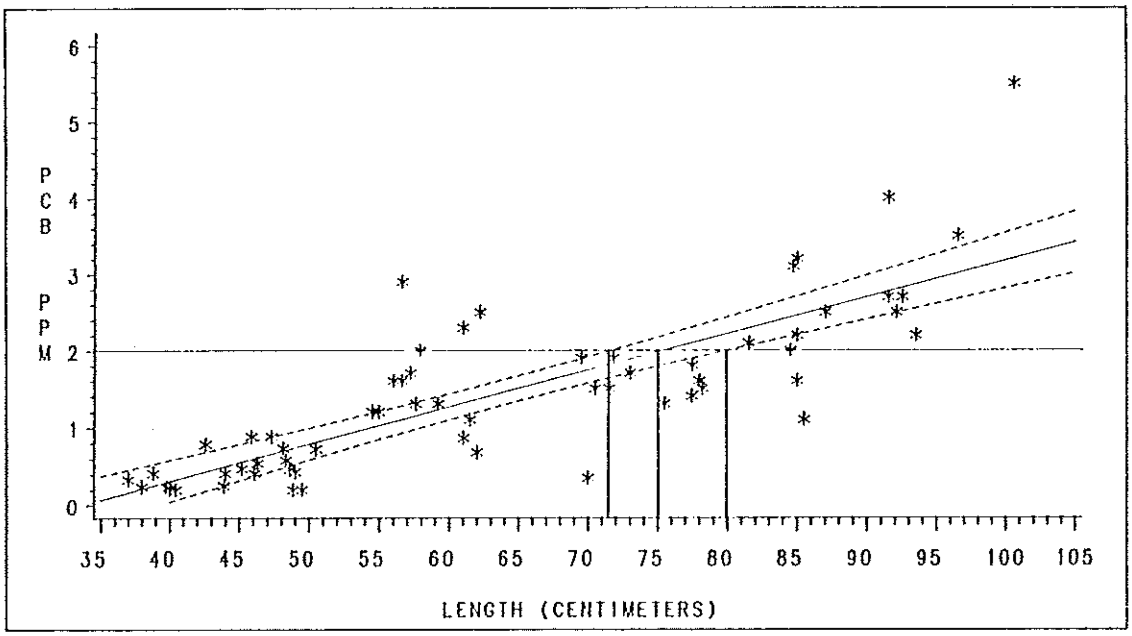

FIGURE 13. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for chinook salmon from the northern zone of Lake Michigan.

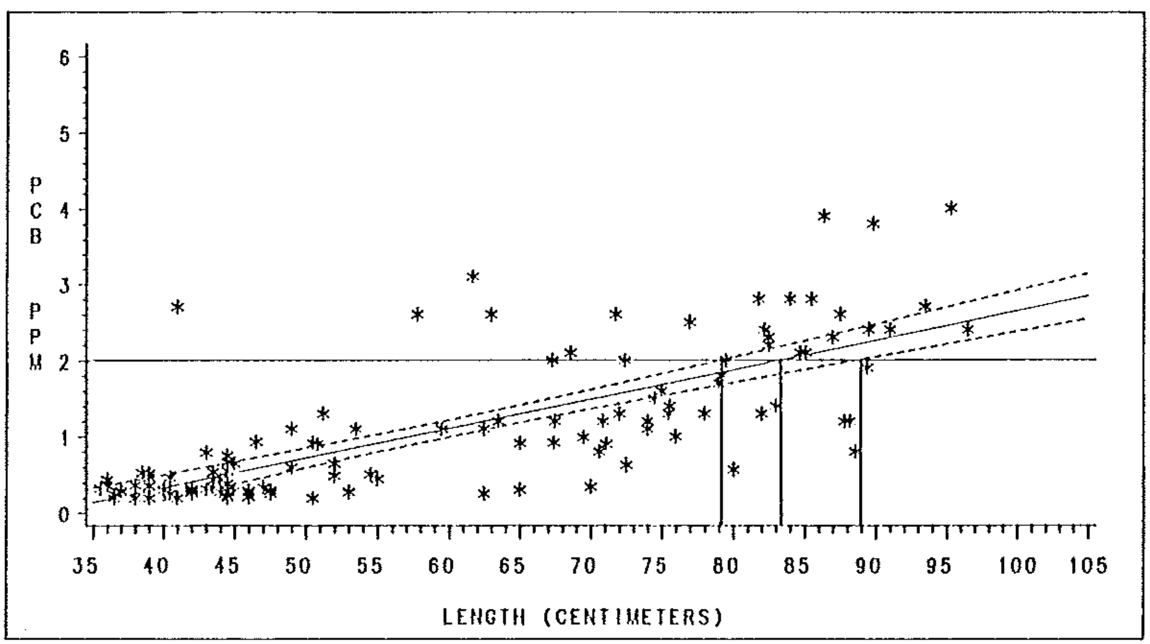

FIGURE 14. Plot of PCB concentration vs. length with line of best fit and 95% confidence limits for chinook salmon from the southern zone of Lake Michigan.

DISCUSSION

The level of PCB contamination in Lake Michigan salmonids is a function of their age and growth rate and thus their size (Weininger 1978), their habitat and degree of movement between habitats (Jensen et al. 1982), their fat content and its seasonal cycle (Olsson et al. 1978), and the interrelationsips among these factors. Each of these factors was supported by the results of this study for one or more species.

The concentration of PCBs was positively related to the length of each species in one or more lake zones. Only for brook trout from the southern zone and rainbow trout from the main lake basin was there no PCB-length relationship. Lake trout, the oldest aged species, accumulated the highest absolute levels of PCBs, exceeding 2.0 ug/g at a size of 58.0 cm and an age of 3-5 years. Chinook salmon grow faster but live only 4 growing seasons in Lake Michigan and thus accumulated lower absolute levels of PCBs, exceeding 2.0 ug/g at a size of 75.0-83.5 cm (depending on where they were caught) and an age of 2-3 years. Brook trout, coho salmon, pink salmon, and rainbow trout live only 2 growing seasons in Lake Michigan and rarely exceeded 2.0 ug/g.

The concentration of PCBs in the various species was also related to their respective fat contents. Brown trout, lake trout, and splake had the highest relative fat contents of all species and also the highest absolute PCB levels. Brown trout, in particular, carried high concentrations of PCBs for their size and age that were positively related to their fat content, exceeding 2.0 ug/g after only 2 growing seasons at a length of 39.2 cm in Green Bay and 53.0 cm in the main lake basin. Splake, similarly, exceeded 2.0 ug/g of PCBs after only 2 growing seasons in Green Bay at a length of 40.4 cm.

A seasonal decrease from spring to autumn of the PCB levels in brown trout from Green Bay corresponded to a decrease in fat tissue from spring to autumn. Seasonal variation of PCB concentration was also evident for lake trout from Lake Michigan and chinook salmon from both Green Bay and Lake Michigan. Levels of PCBs in lake trout from Lake Michigan declined from spring to summer and autumn, whereas PCB levels in chinook salmon from Green Bay and Lake Michigan increased from summer to autumn.

Spatial variation of PCB concentrations was evident for brook, brown, and rainbow trout, and chinook salmon, reflecting a higher level of PCBs in Green Bay. Brook, brown, and rainbow trout from Green Bay had higher levels of PCBs than from either basin of Lake Michigan. Conversely, chinook salmon from the northern basin of Lake Michigan were similar in PCB content to those from Green Bay, but higher than those from the southern basin of Lake Michigan. Chinook salmon, more than the other species, move over large areas in short periods of time and thus may not be as reflective of local habitat conditions. In this case, chinook salmon from both Green Bay and the northern lake basin may be reflective of the same habitat conditions that produced elevated PCB levels in the other 3 species from Green Bay.

Severe PCB contamination of small, spring-stocked brook, brown, and rainbow trout from the Sheboygan River reflect high concentrations of PCBs in the Sheboygan River that have leached out of hydraulic fluid-laden floor sweepings buried in an empty lot adjacent to a manufacturer of small internal combustion engines (Kleinert et al. 1978). Although PCB concentrations of Sheboygan River fish have declined since 1978, the contaminant is still found at unusually high levels, compared to the rest of the southern basin of Lake Michigan. Brook, brown, and rainbow trout that had been stocked in the Sheboygan River 2-3 months prior to sampling contained peak PCB concentrations of 4.0, 3.7, and 5.0 ug/g, respectively. Such high levels of PCBs accumulated by young fish with high growth rates are diluted by the rapid accumulation of new tissue (Jensen et al. 1982). This is probably also the case with Sheboygan River fish once they move into the open waters of Lake Michigan. However, these fish may be susceptible to heavy fishing pressure while in the river, even though they are sublegal in size.

Additionally, PCB levels in Lake Michigan salmonids are influenced by factors such as the circulation patterns of water, seasonal weather patterns, runoff, river sediment erosion, physiological variation, migration patterns, and diets of fish. Each of these factors should be considered when monitoring contaminants in fish for the purpose of advising the fishing public about the possible health risks of consuming Lake Michigan salmonids.

In summary, certain species of Lake Michigan salmonids continue to meet or exceed the FDA tolerance level for PCBs at some length (Fig. 15). Since this is likely to remain a problem, DNR should continue to inform anglers of possible health risks related to their consumption of Lake Michigan salmonids. Lake Michigan anglers should then limit their consumption of these contaminated fish until further epidemiological research determines the human health effects of low-level dietary intakes of PCBs.

MANAGEMENT RECOMMENDATIONS

Certain factors can and should be controlled when monitoring environmental contaminants in Lake Michigan fish. Seasonal and spatial variation can be minimized by conducting sampling efforts at the same time and place each year. Sampling efforts should be scheduled at a time and place each year when the ecosystem is most stable or when logistics permit sampling efforts to be conducted.

Similarly, the sizes of each salmonid species to be sampled need to reflect the same size ranges that are caught by the angling public, in order to properly advise anglers as to which sizes and species of salmonids to curtail and/or eliminate from their diet. Certain "hot spots," such as Green Bay and the Sheboygan River, also need to be identified and separated from the rest of Lake Michigan to accurately describe contaminant problems.

Thus, I recommend that DNR separate Green Bay and the Sheboygan River from the remaining waters of Lake Michigan in future consumption advisories. Secondly, I recommend thorough, annual sampling of the forage base, especially alewife, rainbow smelt, and bloater chubs, to define trends and variation in contaminant levels and to ultimately define food web pathways of PCB transfer. Finally, to improve sampling consistency and to minimize seasonal and spatial variation, I recommend that annual sampling of Lake Michigan salmonids be conducted according to the following schedule: Table 10.

Health advisory for Lake Michigan fish eaters

Wisconsin Department of Natural Resources **May, 1985**

Pollutants have contaminated many Lake Michigan fish

Varying amounts of PCBs (polychlorinated biphenyls), pesticides and other environmental contaminants are found in fish worldwide. These contaminants are also found in Lake Michigan fish.

Eating contaminated fish poses a health risk

State health officials believe that eating even small quantities of contaminants found in fish or other food, in drinking water or from elsewhere in the environment poses a potential risk to public health.

Even fish that contain only low levels of contaminants can pose a health risk if you eat them often enough. That's because some of the contaminants found in fish eventually reach your body fat, where they may remain for many years.

Right now, the risks these contaminants pose to your health are not well-defined. However, long-term exposure to some contaminants found in fish can cause cancer, birth defects and reproductive problems in humans and other mammals. Children, infants and human fetuses are especially vulnerable.

Reducing this health risk is up to you!

The easiest way to protect your health from contaminants is to limit your overall exposure to them in the first place.

In the case of Lake Michigan fish, you have several options: eat fewer fish, eat fish less often, eat only smaller fish or give up eating Lake Michigan fish entirely.

This decision, however, is yours alone to make — with help from a new advisory.

New advisory lists which fish are the least risky to eat

Wisconsin, Illinois, Indiana and Michigan have prepared a new health advisory (explained in the chart below) that tells you which Lake Michigan fish are the least risky to eat.

The advisory applies throughout the entire lake, so the health advice is the same no matter where you catch fish in Lake Michigan.

Which Lake Michigan fish are safest to eat?

 Group 1	 Group 2	 Group 3
Yellow perch Smelt Coho salmon Lake trout under 20 inches in length Rainbow trout	Chinook salmon 25 inches or longer* Lake trout 20 to 25 inches long	Brown trout** Lake trout 25 inches or longer Carp
Eating Group 1 fish poses the lowest health risk. Trim all skin and fat from these fish before cooking them.	**Pregnant women, nursing mothers, women who wish to bear children, infants and youngsters should not eat Group 2 fish.** *All other individuals should limit their consumption of Group 2 fish,* and trim all skin and fat from these fish before cooking them.	**No one should eat Group 3 fish.**

* Not enough samples of chinook salmon smaller than 25 inches have been collected to adequately establish contaminant levels in this species.

** Brown trout show wide, geographic variations in contaminant levels.

Note: Not enough brook trout samples have been collected to adequately establish contaminant levels in this species.

FIGURE 15. Lake Michigan fish consumption advisory issued by the Wisconsin Department of Natural Resources.

TABLE 10. Recommended schedule for annual sampling of Lake Michigan salmonids.

Location	No. of Fish	Size	Time of Year
Pink salmon			
Oconto River	5	all	Fall spawning season
Brook trout			
Green Bay (Grid 703)	5-10	all	Manager's choice*
Bailey's Harbor	5-10	"	" "
Sheboygan River	10	"	Fall coho salmon run
Root River	5-10	"	Manager's choice
Rainbow trout			
Menominee River	5	<20	Fall chinook run
	5	>20	" " "
Grid 1303	5	<20	Manager's choice
	5	>20	" "
Root River	5	<20	Fall chinook run
	5	>20	" " "
Splake			
Green Bay (Grid 703)	5	<15	Manager's choice
	5	>15	" "
Coho salmon			
Sheboygan River	30	all	Fall spawning season
Lake trout			
Mid-lake Reef	10	<25	Fall spawning season
(Grid 1705)	10	>25	" " "
Clay Banks (Grid 905)	10	<25	Fall spawning season
	10	<25	" " "
Brown trout			
Menominee River	5	<20	Fall spawning season
	5	>20	" " "
Bailey's Harbor	5	<20	Manager's choice
	5	>20	" "
Sheboygan River	5	<20	Fall spawning season
	5	>20	" " "
Chinook salmon			
Menominee River	5	<30	Fall spawning season
	5	>30	" " "
Strawberry Creek	5	<30	" " "
	5	>30	" " "
Sheboygan River	5	<30	" " "
	5	>30	" " "
Root River	5	<30	" " "
	5	>30	" " "

* Area Fish Manager should be consulted to determine the optimal sampling dates.

APPENDIX A. Common and scientific names of fish species mentioned in this report.

Common Name	Scientific Name
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Lake trout	*Salvelinus namaycush*
Pink salmon	*Oncorhynchus gorbuscha*
Rainbow trout	*Salmo gairdneri*
Splake	*Salvelinus fontinalis* X *Salvelinus namaycush*
Alewife	*Alosa pseudoharengus*
Bloater chub	*Coregonus hoyi*
Rainbow smelt	*Osmerus mordax*

APPENDIX B. Size of fish estimated to meet U.S. Food and Drug Administration tolerance level of 2.0 ug/g for polychlorinated biphenyls in fish fillets. Predictions are based on linear regression where the PCB-length relationships were significant ($\underline{P} \leq 0.05$).

Species	Lake Zone	Lower 95% Confidence Limit	Predicted Size w/2.0 ug/g	Upper 95% Confidence Limit
Brook trout	Green Bay	35.2 cm 13.8 in	38.5 cm 15.2 in	---* ---
Brown trout	Green Bay	34.2 cm 13.5 in	39.2 cm 15.4 in	43.1 cm 17.0 in
	Main Lake Basin	45.7 cm 18.0 in	53.0 cm 20.9 in	60.5 cm 23.8 in
Chinook salmon	Green Bay	73.5 cm 28.9 in	78.3 cm 30.8 in	85.0 cm 33.5 in
	Northern	71.5 cm 28.0 in	75.0 cm 29.5 in	80.0 cm 31.5 in
	Southern	79.1 cm 31.1 in	83.5 cm 32.9 in	88.9 cm 35.0 in
Lake trout	Main Lake Basin	57.0 cm 22.4 in	58.0 cm 22.8 in	59.0 cm 23.2 in
Rainbow trout	Green Bay	45.8 cm 18.0 in	55.4 cm 21.8 in	--- ---
Splake	Green Bay	39.0 cm 15.4 in	40.4 cm 15.9 in	42.0 cm 16.5 in

* Estimated lengths were not predicted beyond the end points of the available data.

APPENDIX C. 1985 Lake Michigan salmonid PCB data.

PINK SALMON

ZONE=LAKEWIDE

WTRBODY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
OCONTO R	BL STILES D	09/17/85	0.91	2.00	47.0	18.50	0.50	<QUANT.	0.10
OCONTO R	BL STILES D	09/17/85	1.14	2.51	47.0	18.50	0.74		0.36
LK MICH	GRID 1502	08/10/85	1.25	2.75	50.2	19.75	5.90	<QUANT.	0.10
OCONTO R	BL STILES D	09/17/85	1.25	2.75	50.8	20.00	0.58		0.23
OCONTO R	BL STILES D	09/17/85	1.36	2.99	55.9	22.00	0.48		0.32

BROOK TROUT

ZONE=GREEN BAY ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
GREEN BAY	SEAGULL BAR	06/17/85	0.22	0.48	25.7	10.10	3.50		0.58
GREEN BAY	GRID 703	07/12/85	0.21	0.46	28.4	11.20	4.70		0.62
GREEN BAY	GRID 703	08/15/85	0.26	0.57	28.7	11.30	4.10		0.93
GREEN BAY	GRID 703	07/12/85	0.25	0.55	29.2	11.50	4.20		0.88
MENOMINEE	HATTIE STR	09/26/85	0.21	0.46	30.2	11.90	1.90		0.60
GREEN BAY	SEAGULL BAR	05/22/85	0.64	1.41	35.8	14.10	6.80		1.40
GREEN BAY	SEAGULL BAR	05/22/85	1.13	2.49	42.9	16.90	10.00		3.40
GREEN BAY	OFF LTTLE R	05/21/85	1.35	2.97	43.4	17.10	7.90		2.00

ZONE=NORTHERN ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	CLAYBNK SHL	10/22/85	0.26	0.57	29.6	11.65	2.60		0.27
LK MICH	BAILEYS HAR	05/30/85	0.40	0.88	31.0	12.20	4.20		0.50
LK MICH	BAILEYS HAR	07/16/85	0.55	1.21	34.4	13.54	4.70		0.52
LK MICH	CLAYBNK SHL	10/22/85	0.59	1.30	35.5	13.98	4.90		0.38
LK MICH	BAILEYS HAR	04/07/85	0.65	1.43	36.0	14.17	6.20		0.74
LK MICH	BAILEYS HAR	07/17/85	0.70	1.54	37.3	14.68	7.40		0.94
LK MICH	HIBBARDS CR	06/17/85	0.70	1.54	37.5	14.76	7.20		0.40
LK MICH	STURGN BAY	05/07/85	0.66	1.45	38.1	15.00	5.60		0.38
LK MICH	BAILEYS HAR	08/16/85	0.88	1.94	39.3	15.47	6.50		1.00
LK MICH	BAILEYS HAR	08/16/85	0.77	1.69	40.6	15.98	4.30		0.96
LK MICH	BAILEYS HAR	07/12/85	.	.	42.8	16.85	6.60		1.30
LK MICH	BAILEYS HAR	07/11/85	1.18	2.60	43.4	17.09	6.20		0.89
LK MICH	BAILEYS HAR	07/12/85	1.05	2.31	43.6	17.16	8.50		1.10
LK MICH	BAILEYS HAR	07/12/85	.	.	44.5	17.52	7.40		0.75
LK MICH	BAILEYS HAR	07/11/85	1.40	3.08	45.3	17.83	6.00		0.78
LK MICH	BAILEYS HAR	07/17/85	1.30	2.86	45.3	17.83	6.30		0.97
LK MICH	BAILEYS HAR	07/11/85	1.35	2.97	46.3	18.23	6.40		0.80

BROOK TROUT

ZONE=SHEBOYGAN RIVER

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
SHEB R	SHEB HARBOR	06/19/85	0.20	0.44	25.5	10.04	4.50		1.70
SHEB R	SHEB HARBOR	06/19/85	0.20	0.44	25.5	10.04	4.20		2.00
SHEB R	SHEB HARBOR	06/19/85	0.31	0.68	26.0	10.24	4.90		2.30
SHEB R	SHEB HARBOR	06/19/85	0.21	0.46	26.0	10.24	4.70		2.90
SHEB R	SHEB HARBOR	06/19/85	0.22	0.48	26.5	10.43	4.90		1.40
SHEB R	SHEB HARBOR	06/19/85	0.26	0.57	26.5	10.43	6.50		2.00
SHEB R	SHEB HARBOR	06/19/85	0.27	0.59	28.2	11.10	3.10		0.53
SHEB R	KOHLER DAM	09/16/85	0.30	0.66	28.2	11.10	1.50		0.78
SHEB R	SHEB HARBOR	06/19/85	0.31	0.68	28.5	11.22	4.40		0.90
SHEB R	SHEB HARBOR	06/19/85	0.29	0.64	28.5	11.22	3.80		0.75
SHEB R	SHEB HARBOR	06/19/85	0.30	0.66	28.8	11.34	2.70		0.29
SHEB R	SHEB HARBOR	06/19/85	0.33	0.73	30.0	11.81	6.00		1.90
SHEB R	KOHLER DAM	09/16/85	0.29	0.64	31.0	12.20	1.70		2.60
SHEB R	KOHLER DAM	09/16/85	0.37	0.81	32.5	12.80	2.80		3.80
SHEB R	KOHLER DAM	09/16/85	0.35	0.77	32.5	12.80	2.60		0.73
SHEB R	KOHLER DAM	09/16/85	0.43	0.95	33.0	13.00	3.10		3.00
SHEB R	KOHLER DAM	09/16/85	0.51	1.12	35.8	14.10	1.80		1.60
SHEB R	KIWANIS PK	09/25/85	1.00	2.20	40.0	15.75	3.10		4.00

ZONE=SOUTHERN ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1901	04/25/85	0.06	0.13	20.9	8.23	2.60		0.77
LK MICH	GRID 1901	04/25/85	0.13	0.29	24.0	9.45	5.00	<QUANT.	0.10
LK MICH	GRID 1901	06/27/85	0.30	0.66	27.1	10.67	4.70		1.20
LK MICH	GRID 1901	06/27/85	0.29	0.64	27.1	10.67	5.10		1.40
LK MICH	GRID 1901	06/27/85	0.24	0.53	27.8	10.94	5.00		1.20
LK MICH	GRID 1901	06/27/85	0.31	0.68	28.8	11.34	3.10		0.97
LK MICH	GRID 1901	07/03/85	0.45	0.99	32.0	12.60	5.10		1.40

RAINBOW TROUT

ZONE=GREEN BAY ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
OCONTO R	BL STILES D	09/17/85	0.35	0.77	29.2	11.50	4.20		0.58
OCONTO R	BL STILES D	09/17/85	0.24	0.53	29.2	11.50	3.20		0.81
OCONTO R	BL STILES D	09/17/85	0.45	0.99	33.7	13.25	3.60		1.10
MENOMINEE	HATTIE STR	09/26/85	0.36	0.79	34.3	13.50	3.30		0.81
OCONTO R	BL STILES D	09/17/85	0.49	1.08	36.5	14.38	5.30		0.91
MENOMINEE	HATTIE STR	09/26/85	1.80	3.96	41.1	16.20	5.80		0.75
GREEN BAY	GRID 703	07/24/85	1.15	2.53	50.5	19.90	3.30		1.40
OCONTO R	BL STILES D	09/17/85	2.43	5.35	54.6	21.50	13.00		1.60
GREEN BAY	GRID 703	07/21/85	1.85	4.07	57.2	22.50	9.10		2.20
MENOMINEE	HATTIE STR	09/26/85	2.65	5.83	58.4	23.00	9.00		4.20
OCONTO R	BL STILES D	10/15/85	3.24	7.13	59.1	23.25	6.60		1.40
OCONTO R	BL STILES D	10/15/85	3.10	6.82	63.5	25.00	12.00		3.20
OCONTO R	BL STILES D	09/17/85	3.75	8.25	66.0	26.00	10.00		3.60
MENOMINEE	HATTIE STR	09/26/85	3.80	8.36	66.5	26.20	11.00		0.79
MENOMINEE	HATTIE STR	09/26/85	3.40	7.48	68.1	26.80	7.60		2.40

RAINBOW TROUT

ZONE=MAIN LAKE BASIN

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
ROOT R	SIXTH ST	10/16/85	0.19	0.42	25.9	10.20	2.50		0.84
ROOT R	SIXTH ST	10/16/85	0.28	0.62	27.8	10.94	5.10		1.30
ROOT R	SIXTH ST	10/03/85	0.58	1.28	35.1	13.80	5.70		0.82
ROOT R	SIXTH ST	10/16/85	0.56	1.23	35.4	13.94	6.00		0.45
TWIN WEST	TWO RIVERS	04/18/85	0.60	1.32	38.5	15.16	6.90		0.52
ROOT R	SIXTH ST	10/03/85	0.74	1.63	39.4	15.50	7.40	<QUANT.	0.10
TWIN WEST	TWO RIVERS	04/18/85	0.65	1.43	39.5	15.55	4.70		0.34
LK MICH	GRID 1303	04/18/85	0.65	1.43	39.5	15.55	4.50		0.48
LK MICH	GRID 1104	05/25/85	0.85	1.87	40.4	15.90	6.80		0.66
ROOT R	SIXTH ST	10/16/85	0.85	1.87	42.2	16.61	6.30		0.32
ROOT R	SIXTH ST	10/03/85	1.11	2.44	42.7	16.80	13.00		0.26
TWIN WEST	TWO RIVERS	04/18/85	0.85	1.87	42.9	16.89	6.70		0.42
LK MICH	GRID 1303	07/06/85	0.90	1.98	46.5	18.31	1.90	<QUANT.	0.10
LK MICH	GRID 2102	06/01/85	1.30	2.86	50.5	19.90	1.60	<QUANT.	0.10
LK MICH	STURGN BAY	04/04/85	2.00	4.40	55.9	22.00	4.40		0.31
ROOT R	SIXTH ST	10/03/85	2.00	4.40	56.6	22.30	9.00		0.35
ROOT R	SIXTH ST	10/03/85	2.23	4.91	56.9	22.40	12.00		0.52
TWIN WEST	TWO RIVERS	04/04/85	2.20	4.84	57.5	22.64	6.30		0.67
LK MICH	GRID 1303	07/06/85	2.30	5.06	57.5	22.64	7.80		1.60
LK MICH	GRID 2102	06/01/85	2.20	4.84	57.9	22.80	6.60		0.22
ROOT R	SIXTH ST	10/03/85	2.12	4.66	59.2	23.30	6.80		0.24
ROOT R	SIXTH ST	10/16/85	2.34	5.15	59.6	23.46	7.70		0.32
TWIN WEST	TWO RIVERS	04/04/85	2.25	4.95	59.7	23.50	6.20		1.10
LK MICH	GRID 1303	07/06/85	2.50	5.50	63.5	25.00	6.80		0.64
LK MICH	GRID 2002	06/17/85	4.20	9.24	66.0	25.98	20.00		1.70
ROOT R	SIXTH ST	10/03/85	3.56	7.83	67.3	26.50	13.00		0.67
LK MICH	GRID 2002	06/17/85	4.25	9.35	67.3	26.50	14.00		0.94
LK MICH	GRID 2202	07/20/85	2.60	5.72	68.5	26.97	4.70		0.76
LK MICH	GRID 1303	06/19/85	3.90	8.58	71.0	27.95	5.70		2.00
LK MICH	GRID 1303	07/06/85	3.95	8.69	72.5	28.54	4.30		0.87
LK MICH	WHITEFSH PT	06/29/85	3.50	7.70	73.5	28.94	1.10		0.40
LK MICH	GRID 2102	09/07/85	4.25	9.35	75.9	29.88	8.10		0.49
LK MICH	GRID 2002	06/10/85	5.10	11.22	76.2	30.00	6.00		1.00
LK MICH	GRID 2202	07/20/85	4.70	10.34	79.0	31.10	9.70		0.75

ZONE=SHEBOYGAN RIVER

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
SHEB R	SHEB HARBOR	06/19/85	0.20	0.44	24.2	9.53	4.70		1.60
SHEB R	SHEB HARBOR	06/19/85	0.19	0.42	25.7	10.12	3.10		3.30
SHEB R	SHEB HARBOR	06/19/85	0.30	0.66	27.0	10.63	7.30		3.30
SHEB R	KIWANIS PK	09/25/85	0.25	0.55	28.3	11.14	5.00		1.00
SHEB R	KIWANIS PK	09/25/85	0.50	1.10	33.0	12.99	7.50		2.90
SHEB R	SHEB HARBOR	06/19/85	0.74	1.63	34.6	13.62	10.00		4.00
SHEB R	KIWANIS PK	09/25/85	0.60	1.32	36.5	14.37	5.90		0.50
SHEB R	KIWANIS PK	09/25/85	0.65	1.43	37.5	14.76	9.10		1.00
SHEB R	SHEB HARBOR	06/19/85	1.05	2.31	41.0	16.14	11.00		5.00
SHEB R	SHEB HARBOR	06/19/85	1.10	2.42	41.0	16.14	15.00		4.40
SHEB R	KIWANIS PK	09/25/85	2.11	4.64	56.3	22.16	1.50		0.80
SHEB R	KIWANIS PK	09/25/85	2.51	5.52	56.8	22.36	8.90		0.35

SPLAKE

---------ZONE=GREEN BAY ZONE---------

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
GREEN BAY	SEAGULL BAR	06/18/85	0.15	0.33	24.6	9.70	4.00		0.98
GREEN BAY	SEAGULL BAR	05/27/85	0.15	0.33	25.7	10.10	4.60		1.00
GREEN BAY	GRID 703	06/04/85	0.18	0.40	26.9	10.60	3.50		0.71
GREEN BAY	SEAGULL BAR	06/18/85	0.20	0.44	27.2	10.70	3.40		0.76
GREEN BAY	GRID 703	08/14/85	0.18	0.40	27.9	11.00	3.70		0.77
GREEN BAY	GRID 703	07/12/85	0.20	0.44	28.2	11.10	2.10		0.92
GREEN BAY	GRID 703	06/05/85	0.25	0.55	29.0	11.40	3.70		0.90
GREEN BAY	SEAGULL BAR	06/17/85	0.24	0.53	29.0	11.40	4.70		1.50
GREEN BAY	GRID 703	06/05/85	0.22	0.48	29.2	11.50	3.80		0.78
GREEN BAY	GRID 703	07/14/85	0.22	0.48	29.5	11.60	3.30		1.60
GREEN BAY	SEAGULL BAR	06/17/85	0.25	0.55	29.7	11.70	3.50		0.89
GREEN BAY	GRID 703	06/04/85	0.27	0.59	30.0	11.80	6.00		0.80
GREEN BAY	GRID 703	08/14/85	0.29	0.64	31.2	12.30	6.50		1.10
GREEN BAY	GRID 703	10/01/85	0.34	0.75	32.2	12.68	4.60		1.30
GREEN BAY	GRID 703	06/05/85	0.50	1.10	35.6	14.00	7.10		1.90
GREEN BAY	GRID 703	06/04/85	0.50	1.10	36.1	14.20	8.40		1.50
GREEN BAY	GRID 703	06/04/85	0.65	1.43	38.6	15.20	5.90		1.00
GREEN BAY	GRID 802	05/21/85	0.70	1.54	38.6	15.20	5.10		1.40
GREEN BAY	GRID 703	04/11/85	0.62	1.36	38.9	15.30	13.00		2.30
MENOMINEE	HATTIE STR	05/31/85	0.65	1.43	39.4	15.50	10.00		1.80
GREEN BAY	SEAGULL BAR	06/17/85	0.66	1.45	39.9	15.70	5.30		1.30
GREEN BAY	GRID 703	06/05/85	0.60	1.32	40.1	15.80	5.60		0.79
GREEN BAY	GRID 703	06/04/85	0.68	1.50	40.4	15.90	4.50		1.30
GREEN BAY	GRID 703	04/11/85	0.70	1.54	40.6	16.00	9.20		1.80
GREEN BAY	GRID 703	03/15/85	0.80	1.76	41.4	16.30	8.60		2.60
GREEN BAY	GRID 703	03/15/85	0.80	1.76	41.4	16.30	12.00		2.20
GREEN BAY	GRID 703	04/11/85	0.85	1.87	41.4	16.30	11.00		1.70
GREEN BAY	GRID 703	04/15/85	0.80	1.76	41.9	16.50	8.10		1.90
GREEN BAY	GRID 703	07/12/85	0.80	1.76	41.9	16.50	5.30		2.20
GREEN BAY	SEAGULL BAR	05/22/85	0.75	1.65	41.9	16.50	6.50		1.00
GREEN BAY	OFF LTTLE R	05/23/85	1.03	2.27	42.2	16.60	9.20		2.60
GREEN BAY	SEAGULL BAR	05/22/85	1.03	2.27	42.2	16.60	9.50		2.40
GREEN BAY	SEAGULL BAR	05/22/85	1.03	2.27	42.4	16.70	8.50		1.80
GREEN BAY	GRID 703	03/15/85	0.75	1.65	42.7	16.80	8.10		1.90
GREEN BAY	GRID 703	06/04/85	0.95	2.09	42.7	16.80	7.40		2.20
GREEN BAY	GRID 703	03/15/85	0.90	1.98	42.9	16.90	10.00		1.40
GREEN BAY	GRID 703	06/10/85	1.05	2.31	42.9	16.90	12.00		3.20
GREEN BAY	GRID 703	05/31/85	1.03	2.27	43.2	17.00	13.00		2.80
GREEN BAY	GRID 703	04/15/85	0.85	1.87	43.4	17.10	11.00		2.50
GREEN BAY	SEAGULL BAR	05/27/85	0.95	2.09	43.4	17.10	8.20		2.70
GREEN BAY	OFF LTTLE R	05/23/85	1.25	2.75	43.9	17.30	11.00		2.60
GREEN BAY	GRID 703	05/31/85	0.95	2.09	44.5	17.50	11.00		2.20
GREEN BAY	GRID 703	06/03/85	1.15	2.53	44.5	17.50	8.50		2.40
GREEN BAY	GRID 703	06/05/85	0.95	2.09	44.5	17.50	7.40		1.80
GREEN BAY	GRID 703	03/15/85	1.00	2.20	44.7	17.60	12.00		1.90
GREEN BAY	GRID 703	05/31/85	1.10	2.42	45.0	17.70	12.00		2.80
MENOMINEE	HATTIE STR	09/26/85	0.95	2.09	45.5	17.90	9.10		4.30
GREEN BAY	SEAGULL BAR	06/15/85	1.27	2.79	45.5	17.90	10.00		3.00
GREEN BAY	GRID 703	06/04/85	1.35	2.97	45.7	18.00	11.00		3.00

SPLAKE

ZONE=GREEN BAY ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
GREEN BAY	SEAGULL BAR	05/22/85	1.25	2.75	45.7	18.00	11.00		3.00
GREEN BAY	SEAGULL BAR	06/17/85	1.25	2.75	45.7	18.00	8.20		2.10
GREEN BAY	SEAGULL BAR	05/22/85	1.25	2.75	46.0	18.10	10.00		2.40
GREEN BAY	OFF LTTLE R	05/21/85	1.25	2.75	46.2	18.20	8.50		1.90
GREEN BAY	OFF LTTLE R	05/23/85	1.35	2.97	46.7	18.40	9.90		2.10
GREEN BAY	SEAGULL BAR	05/22/85	1.35	2.97	46.7	18.40	12.00		2.90
MENOMINEE	HATTIE STR	09/26/85	1.00	2.20	47.5	18.70	6.00		2.80
GREEN BAY	GRID 703	07/11/85	1.60	3.52	47.5	18.70	8.20		2.00
GREEN BAY	GRID 703	04/11/85	1.26	2.77	47.8	18.80	13.00		2.20
GREEN BAY	GRID 703	06/10/85	1.90	4.18	47.8	18.80	12.00		3.50
GREEN BAY	GRID 703	06/04/85	1.45	3.19	48.0	18.90	10.00		2.80
GREEN BAY	SEAGULL BAR	05/22/85	1.60	3.52	48.3	19.00	14.00		2.90
GREEN BAY	GRID 703	07/12/85	1.70	3.74	50.3	19.80	11.00		3.40
GREEN BAY	GRID 703	08/15/85	1.45	3.19	51.3	20.20	7.00		3.70

COHO SALMON

ZONE=MAIN LAKE BASIN

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
SHEB R	KOHLER DAM	09/16/85	0.49	1.08	35.1	13.80	6.80		0.99
SHEB R	KIWANIS PK	09/25/85	0.55	1.21	36.3	14.28	5.90		1.10
SHEB R	KIWANIS PK	09/25/85	0.70	1.54	39.4	15.50	3.60		0.36
SHEB R	KIWANIS PK	09/25/85	0.90	1.98	39.5	15.54	0.38		0.82
SHEB R	KIWANIS PK	09/25/85	0.75	1.65	39.5	15.55	3.00		0.41
SHEB R	KIWANIS PK	09/25/85	0.70	1.54	39.6	15.60	4.00		0.40
SHEB R	KIWANIS PK	09/25/85	0.75	1.65	40.0	15.75	2.40		0.46
SHEB R	KIWANIS PK	09/25/85	0.80	1.76	41.0	16.14	1.40		0.26
SHEB R	KIWANIS PK	09/25/85	0.75	1.65	41.0	16.14	5.30		1.00
SHEB R	KIWANIS PK	09/25/85	1.00	2.20	42.8	16.85	3.80		0.51
SHEB R	KIWANIS PK	09/25/85	0.95	2.09	43.0	16.93	2.90		0.51
SHEB R	KIWANIS PK	09/25/85	0.95	2.09	43.8	17.24	2.20		0.48
SHEB R	KIWANIS PK	09/25/85	1.25	2.75	45.1	17.75	6.40		0.25
SHEB R	KIWANIS PK	09/25/85	0.91	2.00	46.1	18.15	2.30		0.72
LK MICH	GRID 2202	05/07/85	1.40	3.08	48.5	19.09	4.10		0.43
SHEB R	KIWANIS PK	09/25/85	1.70	3.74	50.5	19.88	7.20		0.63
SHEB R	KIWANIS PK	09/25/85	1.20	2.64	50.9	20.04	0.30	<QUANT.	0.10
SHEB R	KIWANIS PK	09/25/85	1.48	3.26	53.3	20.98	4.20		1.10
LK MICH	GRID 1901	06/04/85	1.60	3.52	54.0	21.26	3.80		0.52
LK MICH	GRID 1901	06/04/85	1.65	3.63	54.1	21.30	5.90		0.90
LK MICH	GRID 2102	06/01/85	1.55	3.41	54.1	21.30	2.40		0.32
LK MICH	GRID 2102	06/01/85	1.50	3.30	54.1	21.30	2.70		0.37
LK MICH	GRID 1901	06/04/85	1.75	3.85	54.4	21.42	5.50		0.86
LK MICH	GRID 1901	06/04/85	1.80	3.96	55.0	21.65	6.00		0.91
SHEB R	KIWANIS PK	09/25/85	1.66	3.65	56.1	22.09	2.10		0.28
LK MICH	GRID 2102	06/01/85	1.85	4.07	56.4	22.20	3.10		0.50
LK MICH	GRID 1901	05/30/85	2.30	5.06	56.7	22.32	8.50		1.30
LK MICH	GRID 2102	06/01/85	1.90	4.18	56.9	22.40	3.90		0.60

COHO SALMON

------------------------------ZONE=MAIN LAKE BASIN------------------------------

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1303	07/06/85	1.70	3.74	57.0	22.44	0.70		0.24
LK MICH	GRID 1901	06/04/85	2.10	4.62	57.1	22.48	8.50		1.10
LK MICH	GRID 2102	06/01/85	1.85	4.07	57.9	22.80	3.00		0.45
SHEB R	KIWANIS PK	09/25/85	2.25	4.95	58.0	22.83	3.60		0.38
LK MICH	GRID 1901	06/04/85	1.80	3.96	58.0	22.83	4.40		0.48
LK MICH	GRID 2102	06/01/85	2.15	4.73	58.4	23.00	5.00		0.50
LK MICH	GRID 1303	06/19/85	2.45	5.39	58.5	23.03	5.40		0.81
LK MICH	GRID 1303	06/25/85	2.30	5.06	58.7	23.11	3.20		0.52
SHEB R	KIWANIS PK	09/25/85	1.92	4.22	58.9	23.19	2.50		1.40
LK MICH	GRID 1901	06/04/85	2.30	5.06	58.9	23.19	6.00		0.92
SHEB R	KIWANIS PK	09/25/85	2.10	4.62	59.0	23.23	2.10		0.63
LK MICH	GRID 1303	06/19/85	2.40	5.28	59.0	23.23	6.10		0.78
LK MICH	GRID 1901	06/04/85	2.40	5.28	59.0	23.23	8.40		1.40
LK MICH	GRID 2102	07/20/85	2.00	4.40	59.0	23.23	3.00		0.56
LK MICH	GRID 2102	06/01/85	2.20	4.84	59.9	23.60	5.10		0.74
LK MICH	GRID 2102	06/01/85	2.35	5.17	60.5	23.80	8.00		1.10
LK MICH	GRID 1303	06/19/85	2.35	5.17	60.5	23.82	4.90		0.70
LK MICH	GRID 1303	07/06/85	2.10	4.62	60.5	23.82	4.70		1.10
SHEB R	KIWANIS PK	09/25/85	1.82	4.00	60.7	23.90	1.00		0.42
LK MICH	GRID 1303	07/06/85	2.70	5.94	60.8	23.94	3.20		0.63
SHEB R	KIWANIS PK	09/25/85	2.25	4.95	61.0	24.02	1.70		0.28
LK MICH	GRID 1303	08/08/85	2.93	6.45	61.2	24.09	4.90		0.73
LK MICH	GRID 1502	08/09/85	2.40	5.28	61.5	24.21	8.20		1.90
SHEB R	KIWANIS PK	09/25/85	2.60	5.72	62.0	24.41	1.70		0.37
SHEB R	KIWANIS PK	09/25/85	2.70	5.94	62.0	24.41	2.70		0.72
LK MICH	GRID 2102	06/01/85	2.80	6.16	62.5	24.60	8.50		1.50
SHEB R	KIWANIS PK	09/25/85	3.15	6.93	63.0	24.80	3.60		2.70
SHEB R	KIWANIS PK	09/25/85	3.30	7.26	64.0	25.20	2.00		0.68
LK MICH	GRID 2102	06/01/85	2.90	6.38	64.0	25.20	8.20		1.00
LK MICH	GRID 1502	08/09/85	3.30	7.26	64.0	25.20	6.70		1.70
LK MICH	GRID 1502	08/09/85	3.15	6.93	65.5	25.79	2.20		0.62
LK MICH	GRID 1303	08/08/85	3.24	7.13	65.6	25.83	6.10		1.10
LK MICH	GRID 1303	07/15/85	3.70	8.14	66.0	25.98	7.70		1.70
LK MICH	GRID 2102	07/20/85	3.10	6.82	66.0	25.98	7.20		1.20
LK MICH	GRID 2102	07/20/85	3.00	6.60	66.0	25.98	5.90		1.70
SHEB R	KIWANIS PK	09/25/85	3.70	8.14	66.5	26.20	3.40		1.20
LK MICH	GRID 2102	07/20/85	3.70	8.14	67.0	26.38	8.50		2.50
SHEB R	KIWANIS PK	09/25/85	3.75	8.25	67.2	26.45	6.00		1.30
LK MICH	GRID 2002	06/10/85	3.65	8.03	67.3	26.50	10.00		1.60
LK MICH	GRID 2102	07/20/85	4.10	9.02	70.0	27.56	9.30		2.90

LAKE TROUT

ZONE=MAIN LAKE BASIN

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 2003	06/17/85	0.22	0.48	29.4	11.57	3.80		0.62
LK MICH	GRID 2003	06/17/85	0.25	0.55	30.3	11.93	5.00		0.54
LK MICH	GRID 1705	08/08/85	0.21	0.46	30.7	12.10	4.90		0.50
LK MICH	GRID 1705	08/08/85	0.21	0.46	31.0	12.20	2.40		0.43
LK MICH	GRID 1903	04/24/84	0.28	0.62	32.0	12.60	5.10		0.62
LK MICH	GRID 1104	10/16/85	0.30	0.66	33.1	13.03	3.60		0.88
LK MICH	GRID 2003	06/17/85	0.35	0.77	33.7	13.27	6.10		0.56
LK MICH	GRID 1705	08/08/85	0.28	0.62	34.3	13.50	4.00		0.54
LK MICH	GRID 1705	08/08/85	0.48	1.06	38.6	15.20	4.90		1.20
LK MICH	GRID 1303	07/30/85	0.55	1.21	39.1	15.39	6.40		0.63
LK MICH	GRID 1303	07/30/85	0.55	1.21	39.3	15.47	6.40		0.68
LK MICH	GRID 1705	08/08/85	0.52	1.14	39.4	15.50	5.20		0.58
LK MICH	GRID 1303	07/30/85	0.55	1.21	39.4	15.51	6.00		0.64
LK MICH	GRID 1303	07/30/85	0.62	1.36	39.5	15.55	7.00		0.70
LK MICH	GRID 1303	07/30/85	0.61	1.34	39.8	15.67	0.73		0.79
LK MICH	GRID 1705	08/08/85	0.51	1.12	39.9	15.70	6.10		0.83
LK MICH	GRID 1303	07/30/85	0.61	1.34	40.1	15.79	4.50		0.55
LK MICH	GRID 1303	07/30/85	0.72	1.58	41.6	16.38	5.20		0.66
LK MICH	GRID 1303	07/30/85	0.70	1.54	42.3	16.65	7.10		0.96
LK MICH	GRID 1303	07/30/85	0.75	1.65	42.4	16.69	8.00		0.95
LK MICH	GRID 1705	08/08/85	0.64	1.41	42.7	16.80	6.80		0.78
LK MICH	GRID 1303	07/30/85	0.76	1.67	43.1	16.97	8.40		1.20
LK MICH	GRID 1303	07/30/85	0.80	1.76	44.1	17.36	6.10		0.70
LK MICH	GRID 1303	07/06/85	1.20	2.64	45.9	18.09	10.00		1.20
LK MICH	GRID 1204	03/22/85	1.00	2.20	46.5	18.30	3.60		0.45
LK MICH	GRID 1303	07/30/85	1.01	2.22	46.9	18.46	7.20		0.94
LK MICH	GRID 1303	07/30/85	1.04	2.29	47.2	18.58	5.40		0.87
LK MICH	GRID 1705	08/08/85	0.98	2.16	47.8	18.80	9.80		1.50
LK MICH	STURGN BAY	06/17/85	1.30	2.86	51.0	20.07	8.90		1.20
LK MICH	GRID 2102	07/20/85	1.80	3.96	51.0	20.08	12.00		2.80
LK MICH	GRID 1303	07/06/85	1.50	3.30	52.0	20.47	12.00		1.40
LK MICH	GRID 1303	07/06/85	1.55	3.41	52.0	20.47	9.30		1.10
LK MICH	GRID 1705	08/08/85	1.33	2.93	52.1	20.50	12.00		1.40
LK MICH	GRID 1705	08/08/85	1.40	3.08	52.8	20.80	15.00		1.50
LK MICH	GRID 1705	08/08/85	1.30	2.86	53.3	21.00	12.00		1.00
LK MICH	GRID 1502	08/10/85	1.40	3.08	53.5	21.06	3.40		0.76
LK MICH	GRID 2102	06/01/85	1.80	3.96	54.9	21.60	16.00		2.20
LK MICH	STURGN BAY	06/17/85	2.00	4.40	55.5	21.85	13.00		1.50
LK MICH	GRID 1303	07/06/85	1.85	4.07	55.5	21.85	12.00		1.00
LK MICH	GRID 1502	08/10/85	1.80	3.96	55.5	21.85	11.00		1.10
LK MICH	GRID 1303	07/06/85	1.96	4.31	56.0	22.04	13.00		1.30
LK MICH	GRID 1705	08/08/85	1.60	3.52	56.1	22.10	12.00		1.40
LK MICH	GRID 1705	08/08/85	1.50	3.30	56.4	22.20	9.20		1.60
LK MICH	GRID 1303	07/06/85	1.85	4.07	56.5	22.24	5.40		1.30
LK MICH	GRID 1303	07/06/85	1.95	4.29	56.5	22.24	12.00		1.30
LK MICH	GRID 905	10/22/85	2.00	4.40	56.9	22.40	11.00		1.40
LK MICH	GRID 1303	07/06/85	2.00	4.40	56.9	22.40	14.00		1.50
LK MICH	GRID 1502	08/10/85	1.55	3.41	57.0	22.44	9.00		1.10
LK MICH	GRID 2102	06/01/85	1.75	3.85	57.4	22.60	14.00		1.70

LAKE TROUT

------------------------------ZONE=MAIN LAKE BASIN------------------------------

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 2102	06/01/85	2.10	4.62	57.4	22.60	14.00		1.80
LK MICH	GRID 2102	06/01/85	1.90	4.18	57.4	22.60	12.00		1.50
LK MICH	GRID 905	10/22/85	2.00	4.40	57.5	22.64	14.00		2.30
LK MICH	GRID 2102	06/01/85	2.05	4.51	57.9	22.80	12.00		1.90
LK MICH	GRID 1104	06/02/85	1.75	3.85	59.7	23.50	8.00		1.10
LK MICH	GRID 1502	07/17/85	2.05	4.51	60.1	23.67	12.00		1.70
LK MICH	GRID 2102	09/07/85	2.45	5.39	60.6	23.86	12.00		2.00
LK MICH	GRID 905	10/22/85	2.00	4.40	60.8	23.94	9.90		2.40
LK MICH	GRID 1701	07/25/85	2.15	4.73	61.0	24.00	15.00		2.50
LK MICH	GRID 905	10/22/85	2.00	4.40	61.2	24.09	14.00		2.10
LK MICH	GRID 2102	06/01/85	2.90	6.38	61.5	24.20	18.00		2.50
LK MICH	GRID 1303	07/06/85	2.30	5.06	61.5	24.21	12.00		1.50
LK MICH	GRID 1502	08/10/85	2.15	4.73	61.5	24.21	12.00		1.20
LK MICH	GRID 905	10/22/85	2.75	6.05	62.0	24.41	11.00		2.70
LK MICH	GRID 905	10/22/85	2.75	6.05	62.0	24.41	12.00		2.40
LK MICH	GRID 1303	07/06/85	2.75	6.05	62.0	24.41	18.00		2.40
LK MICH	GRID 2102	07/20/85	2.30	5.06	62.0	24.41	12.00		2.50
LK MICH	GRID 1502	07/17/85	2.05	4.51	62.0	24.41	15.00		1.90
LK MICH	GRID 1502	08/10/85	2.50	5.50	62.5	24.61	13.00		2.80
LK MICH	GRID 905	10/22/85	2.50	5.50	62.8	24.72	16.00		4.40
LK MICH	GRID 1303	07/06/85	2.70	5.94	63.0	24.80	18.00		2.40
LK MICH	GRID 1705	08/08/85	2.32	5.10	63.0	24.80	15.00		3.10
LK MICH	GRID 1502	08/10/85	4.65	10.23	63.0	24.80	21.00		7.20
LK MICH	STURGN BAY	06/17/85	2.70	5.94	63.2	24.88	17.00		2.10
LK MICH	STURGN BAY	08/14/85	2.23	4.91	64.1	25.24	12.00		3.10
LK MICH	GRID 905	10/22/85	2.50	5.50	64.5	25.39	10.00		3.10
LK MICH	GRID 905	10/22/85	3.50	7.70	64.5	25.39	12.00		2.50
LK MICH	GRID 1303	07/05/85	3.25	7.15	64.5	25.39	17.00		2.60
LK MICH	GRID 1303	07/06/85	2.55	5.61	64.7	25.47	14.00		2.00
LK MICH	GRID 905	10/22/85	2.40	5.28	65.5	25.79	14.00		3.30
LK MICH	GRID 905	10/22/85	3.50	7.70	66.0	25.98	15.00		3.90
LK MICH	GRID 2202	07/20/85	2.90	6.38	66.0	25.98	14.00		4.00
LK MICH	GRID 1303	07/06/85	3.05	6.71	66.0	25.98	19.00		3.10
LK MICH	GRID 2102	06/01/85	3.20	7.04	66.0	25.98	19.00		4.40
LK MICH	GRID 1502	06/21/85	2.27	4.99	66.0	25.98	16.00		3.60
LK MICH	GRID 2102	06/01/85	2.85	6.27	66.0	26.00	16.00		3.00
LK MICH	GRID 2102	06/01/85	3.35	7.37	66.5	26.18	18.00		3.30
LK MICH	GRID 905	10/22/85	2.75	6.05	67.0	26.38	12.00		3.40
LK MICH	GRID 1303	07/06/85	3.20	7.04	67.0	26.38	18.00		3.90
LK MICH	GRID 2102	06/01/85	3.00	6.60	67.0	26.38	18.00		5.80
LK MICH	GRID 1303	07/06/85	3.10	6.82	67.5	26.57	18.00		3.10
LK MICH	GRID 2102	06/01/85	3.10	6.82	67.5	26.57	22.00		3.30
LK MICH	GRID 1303	07/06/85	3.25	7.15	67.8	26.68	26.00		5.00
LK MICH	GRID 905	10/22/85	3.00	6.60	68.0	26.77	16.00		2.30
LK MICH	GRID 2102	06/01/85	3.50	7.70	68.0	26.77	23.00		4.80
LK MICH	GRID 1502	08/10/85	3.05	6.71	68.0	26.77	16.00		3.20
LK MICH	GRID 1502	07/17/85	3.50	7.70	68.5	26.97	20.00		4.50
LK MICH	GRID 1502	08/10/85	3.95	8.69	68.5	26.97	26.00		8.00
LK MICH	GRID 1502	08/10/85	3.25	7.15	68.5	26.97	17.00		4.20

LAKE TROUT

----ZONE=MAIN LAKE BASIN----

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 905	10/22/85	3.50	7.70	69.5	27.36	12.00		2.80
LK MICH	GRID 1502	08/10/85	3.20	7.04	69.5	27.36	17.00		3.30
LK MICH	GRID 1502	07/17/85	3.50	7.70	70.0	27.56	19.00		2.60
LK MICH	GRID 2102	06/01/85	3.60	7.92	70.5	27.76	19.00		6.90
LK MICH	GRID 1503	07/17/85	3.15	6.93	70.5	27.76	16.00		3.00
LK MICH	GRID 2102	06/01/85	3.70	8.14	71.0	27.95	20.00		4.30
LK MICH	GRID 905	10/22/85	3.75	8.25	71.5	28.15	14.00		3.60
LK MICH	GRID 2102	06/01/85	3.90	8.58	71.5	28.15	23.00		9.00
LK MICH	GRID 1502	07/17/85	3.90	8.58	71.5	28.15	13.00		4.80
LK MICH	GRID 1502	07/17/85	3.60	7.92	71.5	28.15	18.00		4.80
LK MICH	GRID 905	10/22/85	4.00	8.80	72.0	28.35	7.90		3.70
LK MICH	GRID 905	10/22/85	4.00	8.80	72.5	28.54	13.00		4.20
LK MICH	GRID 1502	07/17/85	4.45	9.79	72.5	28.54	26.00		6.30
LK MICH	GRID 1502	08/10/85	4.10	9.02	72.5	28.54	21.00		4.40
LK MICH	GRID 1502	07/17/85	3.60	7.92	73.0	28.74	14.00		3.50
LK MICH	GRID 1502	07/17/85	3.40	7.48	73.0	28.74	17.00		3.30
LK MICH	GRID 1502	06/21/85	.	.	73.5	28.94	24.00		9.70
LK MICH	GRID 1502	08/10/85	4.35	9.57	73.5	28.94	21.00		4.30
STURGN BAY	PORTAGE PK	04/19/85	4.60	10.12	73.7	29.00	19.00		6.30
LK MICH	GRID 2102	06/01/85	4.00	8.80	74.5	29.33	18.00		2.90
LK MICH	GRID 2102	06/01/85	4.50	9.90	76.0	29.92	19.00		8.60
LK MICH	GRID 2102	07/20/85	4.80	10.56	76.0	29.92	21.00		7.30
LK MICH	GRID 1502	07/17/85	4.25	9.35	76.0	29.92	20.00		7.10
LK MICH	GRID 2102	07/20/85	4.30	9.46	76.5	30.12	12.00		4.50
LK MICH	GRID 1502	07/17/85	5.00	11.00	76.5	30.12	24.00		11
LK MICH	GRID 1502	08/10/85	4.40	9.68	76.5	30.12	21.00		5.60
LK MICH	GRID 1503	08/10/85	4.80	10.56	76.5	30.12	21.00		7.30
LK MICH	GRID 2102	06/01/85	4.95	10.89	77.0	30.31	18.00		5.00
LK MICH	GRID 2003	06/17/85	5.60	12.32	77.5	30.51	22.00		6.80
LK MICH	GRID 1204	05/25/85	5.55	12.21	78.0	30.70	22.00		9.80
LK MICH	GRID 2102	06/01/85	5.25	11.55	78.0	30.71	9.00		8.40
LK MICH	GRID 2102	07/20/85	4.90	10.78	78.0	30.71	17.00		8.00
LK MICH	GRID 1204	05/25/85	6.65	14.63	78.5	30.90	24.00		5.70
LK MICH	GRID 1104	05/26/85	4.45	9.79	78.7	31.00	16.00		15
LK MICH	GRID 905	10/22/85	5.00	11.00	79.0	31.10	17.00		4.90
LK MICH	GRID 1303	07/06/85	5.85	12.87	79.0	31.10	21.00		14
LK MICH	GRID 1502	06/21/85	.	.	79.0	31.10	14.00		8.10
LK MICH	GRID 1502	08/10/85	5.15	11.33	79.0	31.10	23.00		5.20
LK MICH	GRID 1303	07/06/85	6.30	13.86	79.5	31.30	22.00		4.90
LK MICH	GRID 1502	07/17/85	5.10	11.22	80.5	31.69	18.00		5.30
LK MICH	GRID 1502	07/17/85	4.90	10.78	81.0	31.89	20.00		7.80
LK MICH	STURGN BAY	05/18/85	6.60	14.52	81.3	32.00	21.00		8.80
LK MICH	GRID 2202	07/20/85	5.80	12.76	82.0	32.28	20.00		8.50
LK MICH	GRID 905	10/22/85	5.75	12.65	83.5	32.87	18.00		6.40
LK MICH	GRID 1502	07/17/85	6.40	14.08	84.5	33.27	25.00		10
LK MICH	GRID 905	10/22/85	6.00	13.20	84.5	33.28	14.00		5.30
LK MICH	GRID 1004	05/25/85	6.20	13.64	86.4	34.00	21.00		17
LK MICH	GRID 1502	07/17/85	6.90	15.18	86.5	34.06	16.00		15
LK MICH	GRID 1502	07/17/85	6.50	14.30	88.0	34.64	22.00		8.00

BROWN TROUT

----------ZONE=GREEN BAY ZONE----------

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
OCONTO R	BL STILES D	09/17/85	0.14	0.31	24.5	9.64	1.00		0.22
GREEN BAY	SEAGULL BAR	06/15/85	0.20	0.44	24.8	9.76	7.20		0.76
GREEN BAY	SEAGULL BAR	06/17/85	0.18	0.40	25.1	9.88	6.00		0.70
GREEN BAY	SEAGULL BAR	06/17/85	0.20	0.44	25.4	10.00	5.40		1.00
GREEN BAY	SEAGULL BAR	06/17/85	0.21	0.46	25.4	10.00	4.20		1.10
MENOMINEE	HATTIE STR	09/26/85	0.15	0.33	25.7	10.12	0.90		0.30
OCONTO R	BL STILES D	09/17/85	0.19	0.42	26.0	10.25	2.60		0.24
GREEN BAY	OFF LTTLE R	05/25/85	0.20	0.44	26.2	10.30	4.50		1.80
GREEN BAY	GRID 703	06/28/85	0.18	0.40	27.2	10.70	2.60		1.30
GREEN BAY	SEAGULL BAR	06/15/85	0.24	0.53	27.4	10.80	5.30		1.10
OCONTO R	BL STILES D	09/17/85	0.26	0.57	27.6	10.87	4.00		0.24
OCONTO R	BL STILES D	09/17/85	0.21	0.46	28.0	11.02	2.50		0.52
OCONTO R	BL STILES D	09/17/85	0.25	0.55	28.6	11.25	4.50		0.21
OCONTO R	BL STILES D	09/17/85	0.24	0.53	28.7	11.30	3.60		0.27
OCONTO R	BL STILES D	09/17/85	0.25	0.55	29.5	11.62	1.20	<QUANT.	0.10
GREEN BAY	SEAGULL BAR	05/11/85	0.28	0.62	30.5	12.00	2.70		1.10
GREEN BAY	OFF LTTLE R	05/25/85	0.40	0.88	31.0	12.20	9.10		2.10
OCONTO R	BL STILES D	09/17/85	0.35	0.77	31.1	12.25	3.30		0.20
GREEN BAY	GRID 703	05/11/85	0.40	0.88	31.8	12.52	6.00		3.80
GREEN BAY	GRID 703	07/28/85	0.42	0.92	32.3	12.70	9.10		1.60
GREEN BAY	OFF LTTLE R	05/25/85	0.45	0.99	32.8	12.90	7.80		2.10
OCONTO R	BL STILES D	09/17/85	0.46	1.01	34.3	13.50	1.80		1.60
OCONTO R	BL STILES D	09/17/85	0.58	1.28	35.5	13.98	4.60		0.72
GREEN BAY	GRID 703	05/11/85	0.60	1.32	35.6	14.00	7.50		2.90
GREEN BAY	GRID 703	05/11/85	0.85	1.87	38.1	15.00	7.90		3.70
GREEN BAY	GRID 703	06/30/85	0.70	1.54	39.4	15.50	11.00		2.60
GREEN BAY	GRID 703	07/11/85	1.35	2.97	41.9	16.50	13.00		3.60
GREEN BAY	OFF LTTLE R	09/04/85	0.90	1.98	42.2	16.60	4.40		0.99
GREEN BAY	GRID 703	07/12/85	1.03	2.27	42.4	16.70	15.00		0.49
GREEN BAY	OFF LTTLE R	05/23/85	1.25	2.75	42.9	16.90	14.00		2.60
GREEN BAY	OFF LTTLE R	05/23/85	1.40	3.08	43.4	17.10	11.00		3.10
MENOMINEE	HATTIE STR	09/26/85	0.95	2.09	45.5	17.90	3.80		3.00
GREEN BAY	OFF LTTLE R	05/23/85	1.45	3.19	45.7	18.00	14.00		3.00
GREEN BAY	SEAGULL BAR	06/15/85	1.70	3.74	46.0	18.10	13.00		4.10
OCONTO R	BL STILES D	09/17/85	1.20	2.64	46.3	18.23	4.90		3.40
LK MICH	GRID 606	04/05/85	1.75	3.85	47.5	18.70	17.00		1.40
MENOMINEE	HATTIE STR	04/12/85	1.70	3.74	48.3	19.00	13.00		4.40
GREEN BAY	GRID 802	05/23/85	1.95	4.29	48.3	19.00	16.00		4.10
OCONTO R	BL STILES D	09/17/85	1.80	3.96	48.8	19.21	8.40		0.94
OCONTO R	BL STILES D	09/17/85	1.90	4.18	49.5	19.50	11.00		4.90
MENOMINEE	HATTIE STR	09/26/85	1.65	3.63	49.5	19.50	10.00		2.40
GREEN BAY	GRID 703	07/05/85	2.05	4.51	49.5	19.50	17.00		2.50
MENOMINEE	HATTIE STR	09/26/85	1.55	3.41	49.8	19.60	5.90		1.60
OCONTO R	BL STILES D	09/17/85	1.84	4.05	49.8	19.61	6.70		3.00
GREEN BAY	SEAGULL BAR	06/17/85	2.00	4.40	50.0	19.70	12.00		3.80
GREEN BAY	OFF LTTLE R	05/23/85	2.05	4.51	51.1	20.10	17.00		4.80
GREEN BAY	GRID 703	07/12/85	2.30	5.06	51.3	20.20	14.00		4.00
OCONTO R	BL STILES D	09/17/85	1.95	4.29	51.4	20.23	9.20		1.10
MENOMINEE	HATTIE STR	09/26/85	1.80	3.96	51.6	20.30	7.70		1.60

BROWN TROUT

---ZONE=GREEN BAY ZONE---

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
OCONTO R	BL STILES D	09/17/85	2.35	5.17	52.1	20.50	9.20		3.90
GREEN BAY	GRID 703	07/29/85	2.95	6.49	52.1	20.50	16.00		2.30
GREEN BAY	GRID 703	07/11/85	2.40	5.28	52.3	20.60	15.00		5.70
OCONTO R	BL STILES D	09/17/85	2.05	4.51	52.7	20.75	10.00		2.00
OCONTO R	BL STILES D	09/17/85	2.45	5.39	52.7	20.75	9.20		4.00
OCONTO R	BL STILES D	09/17/85	2.25	4.95	52.7	20.75	6.50		3.60
GREEN BAY	OFF LTTLE R	09/04/85	1.95	4.29	52.8	20.80	9.90		1.10
OCONTO R	BL STILES D	09/17/85	2.35	5.17	52.9	20.83	8.70		1.80
OCONTO R	BL STILES D	09/17/85	2.85	6.27	53.2	20.94	10.00		4.10
OCONTO R	BL STILES D	09/17/85	2.41	5.30	53.2	20.94	10.00		1.50
OCONTO R	BL STILES D	09/17/85	2.76	6.07	53.5	21.06	10.00		4.50
MENOMINEE	HATTIE STR	09/26/85	1.90	4.18	53.6	21.10	8.20		3.20
MENOMINEE	HATTIE STR	09/26/85	1.90	4.18	53.8	21.20	6.10		4.00
GREEN BAY	GRID 703	07/11/85	2.45	5.39	53.8	21.20	15.00		2.40
MENOMINEE	HATTIE STR	09/26/85	1.85	4.07	54.1	21.30	10.00		3.60
MENOMINEE	HATTIE STR	09/26/85	2.25	4.95	54.1	21.30	8.00		3.40
GREEN BAY	GRID 703	07/29/85	2.35	5.17	54.1	21.30	13.00		3.10
GREEN BAY	OFF LTTLE R	05/23/85	2.22	4.88	54.1	21.30	12.00		4.80
GREEN BAY	OFF LTTLE R	07/12/85	2.60	5.72	54.1	21.30	13.00		2.20
GREEN BAY	SEAGULL BAR	07/11/85	2.50	5.50	54.1	21.30	15.00		3.10
GREEN BAY	GRID 703	07/11/85	2.00	4.40	54.6	21.50	12.00		1.20
GREEN BAY	GRID 703	07/17/85	2.40	5.28	54.9	21.60	13.00		2.50
OCONTO R	BL STILES D	09/17/85	2.50	5.50	54.9	21.61	7.80		1.60
GREEN BAY	OFF LTTLE R	05/23/85	2.65	5.83	55.5	21.87	16.00		5.50
GREEN BAY	OFF LTTLE R	09/04/85	2.25	4.95	55.9	22.00	10.00		3.50
GREEN BAY	SEAGULL BAR	06/17/85	2.70	5.94	56.1	22.10	4.60		4.60
MENOMINEE	HATTIE STR	09/26/85	2.40	5.28	56.6	22.30	8.90		2.80
MENOMINEE	HATTIE STR	09/26/85	2.45	5.39	56.6	22.30	11.00		2.10
GREEN BAY	SISTER BAY	04/00/85	2.60	5.72	57.0	22.44	14.00		2.20
MENOMINEE	HATTIE STR	09/26/85	2.35	5.17	57.7	22.70	8.40		3.60
MENOMINEE	HATTIE STR	09/26/85	2.65	5.83	57.9	22.80	11.00		5.10
GREEN BAY	PESHTIGO LT	07/08/85	3.28	7.22	58.4	23.00	16.00		1.70
GREEN BAY	GRID 703	05/08/85	3.60	7.92	60.5	23.82	21.00		3.20
GREEN BAY	PESHTIGO LT	07/08/85	3.62	7.96	61.2	24.10	16.00		2.50
MENOMINEE	HATTIE STR	09/26/85	3.35	7.37	61.5	24.20	12.00		1.50
GREEN BAY	GRID 703	07/12/85	4.20	9.24	63.0	24.80	13.00		4.70
MENOMINEE	HATTIE STR	09/26/85	3.40	7.48	64.8	25.50	4.10		2.00
GREEN BAY	GRID 703	07/11/85	4.25	9.35	64.8	25.50	16.00		4.20

BROWN TROUT

ZONE=MAIN LAKE BASIN

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 2102	06/21/85	0.38	0.84	28.5	11.22	8.60		0.98
LK MICH	GRID 2102	06/21/85	.	.	31.0	12.20	8.30		1.20
LK MICH	GRID 1502	08/09/85	0.55	1.21	34.0	13.38	5.20		2.00
LK MICH	GRID 1502	08/10/85	0.70	1.54	35.0	13.78	9.30		3.50
LK MICH	GRID 805	07/05/85	1.05	2.31	35.7	14.06	13.00		1.50
LK MICH	GRID 1502	06/21/85	0.75	1.65	37.0	14.56	11.00		2.00
LK MICH	GRID 1502	08/10/85	0.75	1.65	38.0	14.96	9.20		1.70
LK MICH	BAILEYS HAR	10/09/85	0.79	1.74	40.0	15.75	3.70		0.48
LK MICH	GRID 1502	06/21/85	1.03	2.27	40.0	15.75	15.00		3.30
LK MICH	BAILEYS HAR	10/02/85	1.10	2.42	41.4	16.30	5.70		0.77
LK MICH	GRID 1502	06/21/85	0.91	2.00	43.0	16.93	16.00		1.70
LK MICH	BAILEYS HAR	09/25/85	1.31	2.88	43.6	17.16	6.90		0.54
LK MICH	BAILEYS HAR	04/07/85	1.45	3.19	45.0	17.72	14.00		1.30
LK MICH	BAILEYS HAR	04/07/85	1.75	3.85	45.3	17.83	20.00		1.10
LK MICH	GRID 905	05/02/85	1.85	4.07	45.8	18.03	21.00		1.10
LK MICH	GRID 1303	07/29/85	1.80	3.96	46.6	18.35	14.00		1.70
LK MICH	BAILEYS HAR	10/09/85	1.25	2.75	47.6	18.75	6.80		1.20
LK MICH	GRID 1303	07/29/85	2.10	4.62	47.8	18.82	14.00		1.10
STURGN BAY	PORTAGE PK	04/09/85	1.05	2.31	47.9	18.87	14.00		3.60
LK MICH	BAILEYS HAR	04/07/85	1.90	4.18	48.0	18.90	15.00		1.70
LK MICH	GRID 1502	07/15/85	2.10	4.62	48.5	19.09	16.00		2.00
LK MICH	LILLY BAY	05/03/85	2.05	4.51	49.0	19.29	17.00		0.93
LK MICH	GRID 1303	07/06/85	1.90	4.18	49.5	19.49	17.00		1.80
LK MICH	GRID 607	04/26/85	1.90	4.18	49.5	19.50	15.00		0.80
LK MICH	BAILEYS HAR	04/07/85	2.00	4.40	49.7	19.57	18.00		1.40
LK MICH	GRID 1502	06/21/85	1.48	3.26	50.0	19.68	16.00		1.80
LK MICH	GRID 1502	06/21/85	1.02	2.24	50.0	19.68	19.00		2.30
LK MICH	BAILEYS HAR	04/07/85	1.85	4.07	50.2	19.76	17.00		1.00
LK MICH	BAILEYS HAR	09/25/85	1.44	3.17	50.3	19.80	7.60		1.40
LK MICH	GRID 1303	07/06/85	2.20	4.84	50.3	19.80	15.00		1.20
LK MICH	BAILEYS HAR	04/07/85	2.05	4.51	51.0	20.08	17.00		1.60
LK MICH	GRID 1502	06/21/85	1.82	4.00	51.0	20.08	18.00		2.60
LK MICH	STURGN BAY	04/23/85	1.45	3.19	51.1	20.10	3.00		1.70
LK MICH	BAILEYS HAR	04/07/85	1.80	3.96	51.5	20.28	11.00		1.30
LK MICH	GRID 1502	06/21/85	.	.	51.5	20.28	15.00		1.50
LK MICH	GRID 1502	06/21/85	.	.	51.5	20.28	19.00		1.60
LK MICH	BAILEYS HAR	04/07/85	2.20	4.84	51.8	20.39	19.00		4.30
LK MICH	BAILEYS HAR	04/07/85	2.35	5.17	52.0	20.47	21.00		1.70
LK MICH	GRID 2102	06/21/85	2.27	4.99	52.0	20.47	16.00		1.80
LK MICH	GRID 1004	06/25/85	2.45	5.39	52.2	20.55	11.00		3.80
STURGN BAY	PORTAGE PK	08/29/85	2.40	5.28	52.4	20.63	11.00		3.20
LK MICH	GRID 1402	06/20/85	3.00	6.60	52.4	20.63	1.70		1.70
LK MICH	GRID 2102	09/07/85	3.50	7.70	53.0	20.87	10.00		2.20
LK MICH	BAILEYS HAR	10/02/85	2.20	4.84	53.1	20.91	9.00		2.40
LK MICH	GRID 2002	05/18/85	2.52	5.54	53.3	21.00	17.00		1.20
LK MICH	GRID 1502	08/10/85	2.30	5.06	53.5	21.06	10.00		1.10
LK MICH	BAILEYS HAR	09/25/85	2.39	5.26	53.6	21.10	8.50		1.80
LK MICH	GRID 1303	07/06/85	2.80	6.16	54.5	21.46	14.50		1.10
LK MICH	GRID 1502	08/10/85	2.40	5.28	54.5	21.46	9.80		0.91

BROWN TROUT

ZONE=MAIN LAKE BASIN

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	BAILEYS HAR	09/16/85	2.25	4.95	54.8	21.57	7.80		1.90
LK MICH	BAILEYS HAR	04/07/85	3.30	7.26	56.0	22.05	18.00		0.82
LK MICH	GRID 1303	07/29/85	3.10	6.82	56.7	22.32	15.00		1.60
LK MICH	GRID 1303	07/06/85	3.35	7.37	57.0	22.44	16.00		1.70
LK MICH	GRID 1502	08/10/85	3.25	7.15	57.0	22.44	13.00		2.70
LK MICH	GRID 1502	08/10/85	3.45	7.59	57.0	22.44	17.00		2.60
LK MICH	GRID 1502	08/09/85	3.50	7.70	58.0	22.83	16.00		1.40
LK MICH	GRID 1502	08/10/85	3.45	7.59	58.0	22.83	13.00		1.60
LK MICH	GRID 2002	06/10/85	3.45	7.59	58.4	23.00	22.00		1.20
LK MICH	LILLY BAY	06/30/85	4.00	8.80	59.0	23.23	22.00		4.70
LK MICH	GRID 1303	07/29/85	3.60	7.92	59.3	23.35	16.00		1.30
LK MICH	GRID 2102	06/01/85	3.24	7.13	59.4	23.40	20.00		4.00
LK MICH	GRID 1502	08/10/85	3.40	7.48	59.5	23.42	14.00		1.40
STURGN BAY	PORTAGE PK	08/01/85	4.55	10.01	59.8	23.54	14.00		3.90
LK MICH	NORTH BAY	05/28/85	4.15	9.13	60.0	23.62	21.00		4.50
LK MICH	GRID 2002	06/12/85	4.40	9.68	60.0	23.62	24.00		0.93
LK MICH	GRID 1901	06/06/85	3.80	8.36	60.5	23.82	20.00		3.80
LK MICH	GRID 2002	04/25/85	3.45	7.59	61.0	24.00	7.10		2.00
LK MICH	GRID 2002	05/10/85	3.65	8.03	61.0	24.00	23.00		2.80
LK MICH	LILLY BAY	06/28/85	3.80	8.36	61.0	24.02	14.00		1.10
LK MICH	GRID 1502	08/10/85	3.90	8.58	61.0	24.02	14.00		1.70
LK MICH	GRID 1502	08/10/85	3.55	7.81	61.5	24.21	13.00		2.20
LK MICH	GRID 1502	08/10/85	3.45	7.59	61.5	24.21	12.00		1.60
LK MICH	BAILEYS HAR	06/29/85	5.40	11.88	62.5	24.60	21.00		2.60
LK MICH	GRID 1901	05/15/85	3.25	7.15	62.5	24.61	13.00		3.70
LK MICH	GRID 1502	08/10/85	3.70	8.14	62.5	24.61	12.00		1.40
LK MICH	GRID 1502	07/17/85	3.65	8.03	63.5	25.00	13.00		2.30
LK MICH	GRID 1303	07/29/85	3.80	8.36	63.6	25.04	13.00		1.30
LK MICH	GRID 1502	08/10/85	4.25	9.35	64.5	25.39	10.00		2.10
LK MICH	GRID 1502	08/10/85	4.65	10.23	65.0	25.59	17.00		2.20
LK MICH	GRID 1502	08/10/85	4.90	10.78	66.0	25.98	12.00		2.90
LK MICH	GRID 1502	08/10/85	5.10	11.22	66.5	26.18	14.00		3.50
LK MICH	GRID 2002	06/17/85	5.55	12.21	67.5	26.57	20.00		2.10
LK MICH	GRID 1004	04/26/85	4.70	10.34	68.6	27.00	9.20		2.90
LK MICH	BAILEYS HAR	04/07/85	5.15	11.33	69.5	27.36	11.00		5.80
LK MICH	GRID 1502	08/09/85	7.50	16.50	78.5	30.90	16.00		2.30

ZONE=SHEBOYGAN RIVER

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
SHEB R	SHEB HARBOR	06/19/85	0.14	0.31	21.5	8.46	5.30		3.50
SHEB R	SHEB HARBOR	06/19/85	0.16	0.35	24.5	9.64	3.90		2.10
SHEB R	SHEB HARBOR	06/19/85	0.25	0.55	26.0	10.24	9.40		2.60
SHEB R	SHEB HARBOR	06/19/85	0.29	0.64	26.5	10.43	6.80		2.40
SHEB R	KIWANIS PK	09/25/85	0.70	1.54	35.0	13.78	4.70		3.20
SHEB R	KIWANIS PK	09/25/85	3.50	7.70	49.0	19.29	7.30		1.50
SHEB R	KIWANIS PK	09/25/85	1.60	3.52	49.7	19.57	8.60		2.40
SHEB R	KIWANIS PK	09/25/85	1.95	4.29	50.2	19.76	6.00		2.20
SHEB R	KIWANIS PK	09/25/85	2.27	4.99	50.5	19.88	9.80		1.90
SHEB R	KIWANIS PK	09/25/85	2.35	5.17	55.0	21.65	14.00		3.00
SHEB R	KIWANIS PK	09/25/85	3.50	7.70	55.5	21.85	10.50		2.10
SHEB R	KIWANIS PK	09/25/85	2.41	5.30	55.6	21.89	7.00		1.60
SHEB R	KIWANIS PK	09/25/85	2.80	6.16	58.5	23.03	17.00		3.70

CHINOOK SALMON

ZONE=GREEN BAY ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
GREEN BAY	PESHTIGO LT	07/08/85	0.48	1.06	39.1	15.40	0.70	<QUANT.	0.10
GREEN BAY	GRID 703	07/29/85	0.35	0.77	43.2	17.00	2.40		0.49
GREEN BAY	PESHTIGO LT	07/08/85	0.85	1.87	47.0	18.50	1.20		0.23
GREEN BAY	PESHTIGO LT	07/08/85	1.08	2.38	48.0	18.90	5.20		0.89
GREEN BAY	PESHTIGO LT	07/08/85	1.02	2.24	49.3	19.40	3.90		1.00
MENOMINEE	HATTIE STR	09/26/85	1.10	2.42	53.8	21.20	3.20		1.20
OCONTO R	BL STILES D	09/17/85	2.05	4.51	54.0	21.25	5.20		1.70
MENOMINEE	HATTIE STR	09/26/85	1.75	3.85	54.6	21.50	4.40		1.50
MENOMINEE	HATTIE STR	09/26/85	1.90	4.18	56.6	22.30	4.00		1.40
MENOMINEE	HATTIE STR	09/26/85	1.90	4.18	57.4	22.60	4.90		1.60
MENOMINEE	HATTIE STR	09/26/85	1.95	4.29	57.4	22.60	5.30		1.40
MENOMINEE	HATTIE STR	09/26/85	1.95	4.29	57.7	22.70	4.00		1.40
MENOMINEE	HATTIE STR	09/26/85	2.00	4.40	58.4	23.00	4.50		1.10
MENOMINEE	HATTIE STR	09/26/85	2.10	4.62	58.9	23.20	2.60		1.80
OCONTO R	BL STILES D	10/15/85	2.35	5.17	59.1	23.25	2.00		1.20
MENOMINEE	HATTIE STR	09/26/85	2.05	4.51	59.7	23.50	3.30		1.10
MENOMINEE	HATTIE STR	09/26/85	2.35	5.17	60.2	23.70	5.30		1.60
MENOMINEE	HATTIE STR	09/26/85	2.55	5.61	60.5	23.80	5.40		1.20
MENOMINEE	HATTIE STR	09/26/85	3.15	6.93	72.6	28.60	3.80		2.00
MENOMINEE	HATTIE STR	09/26/85	4.30	9.46	75.7	29.80	3.40		1.80
MENOMINEE	HATTIE STR	09/20/85	7.05	15.51	76.2	30.00	3.90		2.30
GREEN BAY	GRID 703	07/07/85	5.90	12.98	78.7	31.00	10.00		2.20
OCONTO R	BL STILES D	10/15/85	5.15	11.33	83.8	33.00	0.54		1.70
OCONTO R	BL STILES D	09/17/85	6.60	14.52	84.5	33.25	1.30		2.50
OCONTO R	BL STILES D	10/15/85	6.10	13.42	84.5	33.25	3.10		2.10
OCONTO R	BL STILES D	09/17/85	7.50	16.50	85.1	33.50	2.00		2.20
OCONTO R	BL STILES D	10/15/85	7.30	16.06	87.6	34.50	4.00		1.80

ZONE=NORTHERN ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1303	07/06/85	0.50	1.10	37.0	14.57	1.40		0.33
LK MICH	GRID 1303	07/06/85	0.50	1.10	38.0	14.96	0.80		0.24
LK MICH	GRID 1303	07/30/85	0.59	1.30	38.8	15.28	1.40		0.41
LK MICH	GRID 1303	08/08/85	0.59	1.30	39.8	15.67	1.50		0.23
LK MICH	GRID 1303	07/06/85	0.60	1.32	40.0	15.75	1.50		0.21
LK MICH	GRID 1303	07/30/85	0.68	1.50	40.0	15.75	0.90		0.22
LK MICH	GRID 1303	07/06/85	0.64	1.41	40.5	15.94	0.80	<QUANT.	0.10
LK MICH	GRID 1303	07/30/85	0.79	1.74	42.6	16.77	4.60		0.78
LK MICH	GRID 1303	07/30/85	0.74	1.63	43.9	17.28	1.30		0.25
LK MICH	GRID 506	07/12/85	0.75	1.65	44.0	17.32	1.50		0.41
LK MICH	GRID 1303	07/30/85	0.90	1.98	45.2	17.80	2.80		0.47
LK MICH	GRID 1303	07/30/85	0.99	2.18	45.9	18.07	6.00		0.88
LK MICH	GRID 1303	07/30/85	0.95	2.09	46.1	18.15	2.80		0.41
LK MICH	GRID 1303	07/30/85	0.96	2.11	46.3	18.23	3.10		0.54

CHINOOK SALMON

ZONE=NORTHERN ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1303	07/30/85	1.14	2.51	47.3	18.62	4.50		0.88
LK MICH	GRID 1303	07/30/85	1.11	2.44	48.1	18.94	5.00		0.73
LK MICH	GRID 1303	07/30/85	1.11	2.44	48.3	19.02	3.60		0.58
LK MICH	GRID 1303	07/30/85	1.12	2.46	48.6	19.13	3.00		0.46
LK MICH	GRID 1303	07/06/85	0.85	1.87	48.8	19.23	0.60	<QUANT.	0.10
LK MICH	GRID 1303	07/06/85	1.25	2.75	49.0	19.29	3.00		0.43
LK MICH	GRID 1303	07/06/85	1.15	2.53	49.5	19.49	0.90	<QUANT.	0.10
STURGN BAY	STRWBRRY CR	10/03/85	1.50	3.30	50.5	19.88	3.20		0.72
STURGN BAY	STRWBRRY CR	10/03/85	1.70	3.74	54.5	21.46	4.30		1.20
STURGN BAY	STRWBRRY CR	10/03/85	1.70	3.74	55.0	21.65	3.90		1.20
STURGN BAY	STRWBRRY CR	10/03/85	2.00	4.40	56.0	22.05	3.30		1.60
STURGN BAY	STRWBRRY CR	10/03/85	2.00	4.40	56.6	22.28	2.80		1.60
STURGN BAY	STRWBRRY CR	10/03/85	2.00	4.40	56.6	22.28	5.90		2.90
STURGN BAY	STRWBRRY CR	10/03/85	2.00	4.40	57.2	22.52	4.90		1.70
STURGN BAY	STRWBRRY CR	10/03/85	1.95	4.29	57.6	22.68	4.30		1.30
STURGN BAY	STRWBRRY CR	10/03/85	2.00	4.40	57.9	22.80	4.60		2.00
LK MICH	GRID 1303	07/06/85	2.00	4.40	59.2	23.31	6.30		1.30
STURGN BAY	STRWBRRY CR	10/03/85	2.50	5.50	61.0	24.01	6.40		2.30
LK MICH	GRID 905	06/11/85	2.30	5.06	61.0	24.02	9.40		0.86
LK MICH	GRID 1303	07/06/85	2.05	4.51	61.5	24.21	5.50		1.10
LK MICH	GRID 1303	07/06/85	2.10	4.62	62.0	24.41	5.50		0.68
STURGN BAY	STRWBRRY CR	10/03/85	2.50	5.50	62.2	24.49	3.30		2.50
LK MICH	GRID 1303	06/19/85	3.50	7.70	69.5	27.36	11.00		1.90
LK MICH	GRID 1303	07/06/85	3.10	6.82	70.5	27.76	10.00		1.50
STURGN BAY	STRWBRRY CR	10/03/85	3.30	7.26	71.5	28.15	1.90		1.50
LK MICH	GRID 805	07/05/85	4.60	10.12	71.8	28.27	11.00		1.90
LK MICH	GRID 1303	06/19/85	4.20	9.24	73.0	28.74	9.00		1.70
STURGN BAY	STRWBRRY CR	10/03/85	3.50	7.70	75.5	29.72	3.40		1.30
LK MICH	GRID 1303	05/22/85	4.95	10.89	77.5	30.50	9.40		1.40
LK MICH	GRID 1302	06/07/85	4.95	10.89	77.5	30.51	7.50		1.80
STURGN BAY	STRWBRRY CR	10/03/85	4.20	9.24	78.0	30.71	1.70		1.60
STURGN BAY	STRWBRRY CR	10/03/85	3.80	8.36	78.2	30.79	1.50		1.50
LK MICH	BAILEYS HAR	06/29/85	6.10	13.42	81.5	32.09	7.20		2.10
LK MICH	GRID 1303	06/19/85	7.10	15.62	84.5	33.27	9.00		2.00
LK MICH	WHITEFSH PT	07/05/85	6.55	14.41	84.7	33.35	8.90		3.10
LK MICH	GRID 1303	06/07/85	6.70	14.74	85.0	33.46	13.00		3.20
LK MICH	GRID 1303	07/06/85	6.10	13.42	85.0	33.46	6.50		1.60
LK MICH	GRID 1303	07/06/85	7.35	16.17	85.0	33.46	9.00		2.20
LK MICH	GRID 1303	07/06/85	5.95	13.09	85.5	33.66	5.90		1.10
LK MICH	GRID 805	06/29/85	7.40	16.28	87.0	34.25	10.00		2.50
LK MICH	GRID 1303	06/19/85	8.65	19.03	91.5	36.02	11.00		4.00
LK MICH	GRID 1303	07/06/85	7.70	16.94	91.5	36.02	9.00		2.70
LK MICH	GRID 805	06/29/85	8.00	17.60	92.1	36.25	7.90		2.50
LK MICH	GRID 806	07/19/85	9.20	20.24	92.5	36.42	8.90		2.70
LK MICH	GRID 1303	07/20/85	8.45	18.59	93.5	36.81	9.40		2.20
LK MICH	STURGN BAY	07/20/85	10.50	23.10	96.5	37.99	11.00		3.50
STURGN BAY	SHIP CANAL	08/28/85	.	.	100.5	39.57	6.10		5.50

CHINOOK SALMON

--ZONE=SOUTHERN ZONE--

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 2102	06/21/85	0.33	0.73	32.0	12.60	13.00		0.42
LK MICH	GRID 2102	06/21/85	.	.	35.5	13.98	1.80		0.33
LK MICH	GRID 2102	06/21/85	.	.	36.0	14.17	1.80		0.44
LK MICH	GRID 2102	06/21/85	0.56	1.23	36.0	14.17	0.90		0.36
LK MICH	GRID 2102	06/21/85	0.43	0.95	36.0	14.17	0.70		0.38
LK MICH	GRID 2102	06/21/85	0.44	0.97	36.5	14.37	0.70	<QUANT.	0.10
LK MICH	GRID 1502	07/17/85	0.40	0.88	36.5	14.37	1.00		0.25
LK MICH	GRID 2102	06/21/85	0.60	1.32	37.0	14.57	1.00		0.28
LK MICH	GRID 1502	07/17/85	0.40	0.88	37.0	14.57	1.20		0.30
LK MICH	GRID 1502	07/17/85	0.45	0.99	38.0	14.96	0.90	<QUANT.	0.10
LK MICH	GRID 1502	07/17/85	0.40	0.88	38.0	14.96	0.50		0.37
LK MICH	GRID 2102	06/21/85	0.55	1.21	38.5	15.16	1.10		0.53
LK MICH	GRID 2102	06/21/85	0.53	1.17	39.0	15.35	1.00		0.52
LK MICH	GRID 2102	06/21/85	.	.	39.0	15.35	1.40		0.36
LK MICH	GRID 1502	07/17/85	0.50	1.10	39.0	15.35	0.80	<QUANT.	0.10
LK MICH	GRID 1502	07/17/85	0.55	1.21	39.0	15.35	2.00		0.47
LK MICH	GRID 1502	08/10/85	0.70	1.54	40.0	15.75	1.70		0.31
LK MICH	GRID 1502	07/17/85	0.65	1.43	40.5	15.94	4.00		0.47
LK MICH	GRID 1502	07/17/85	0.55	1.21	40.5	15.94	1.10		0.26
SHEB R	KIWANIS PK	09/25/85	0.75	1.65	41.0	16.14	9.10		2.70
LK MICH	GRID 1502	08/10/85	0.65	1.43	41.0	16.14	0.93	<QUANT.	0.10
LK MICH	GRID 1502	08/10/85	0.65	1.43	41.0	16.14	0.68	<QUANT.	0.10
LK MICH	GRID 1502	07/17/85	0.60	1.32	42.0	16.54	1.20		0.26
LK MICH	GRID 1502	08/10/85	0.75	1.65	42.0	16.54	1.60		0.32
LK MICH	GRID 1502	08/10/85	0.80	1.76	42.0	16.54	1.40		0.29
LK MICH	GRID 1502	08/10/85	0.80	1.76	43.0	16.93	1.60		0.32
LK MICH	GRID 1502	08/10/85	0.85	1.87	43.0	16.93	2.10		0.79
LK MICH	GRID 1502	07/17/85	0.70	1.54	43.5	17.12	0.80		0.34
LK MICH	GRID 1502	08/10/85	0.80	1.76	43.5	17.12	3.80		0.54
LK MICH	GRID 1502	08/10/85	0.80	1.76	43.5	17.12	1.50		0.44
LK MICH	GRID 1503	08/10/85	0.80	1.76	44.0	17.32	2.10		0.44
LK MICH	GRID 1502	08/10/85	0.80	1.76	44.0	17.32	1.00		0.28
LK MICH	GRID 1502	08/10/85	0.90	1.98	44.5	17.52	2.50		0.23
LK MICH	GRID 1502	08/10/85	0.90	1.98	44.5	17.52	2.40		0.66
LK MICH	GRID 1502	08/10/85	0.80	1.76	44.5	17.52	2.00		0.55
LK MICH	GRID 1502	08/10/85	0.85	1.87	44.5	17.52	1.10		0.20
LK MICH	GRID 1502	08/10/85	0.85	1.87	44.5	17.52	2.00		0.39
LK MICH	GRID 1502	08/10/85	0.80	1.76	44.5	17.52	2.60		0.67
LK MICH	GRID 1502	08/10/85	0.85	1.87	44.5	17.52	1.60		0.29
LK MICH	GRID 1502	08/10/85	0.90	1.98	44.5	17.52	4.40		0.75
LK MICH	GRID 1502	07/17/85	0.75	1.65	45.0	17.72	0.90		0.30
LK MICH	GRID 1502	08/10/85	0.75	1.65	45.0	17.72	2.60		0.65
LK MICH	GRID 1502	07/15/85	0.90	1.98	46.0	18.11	0.85		0.21
LK MICH	GRID 1502	08/10/85	0.95	2.09	46.0	18.11	0.79		0.23
LK MICH	GRID 1502	08/10/85	0.95	2.09	46.0	18.11	1.60		0.30
LK MICH	GRID 1502	08/10/85	0.90	1.98	46.0	18.11	1.40		0.28
LK MICH	GRID 1502	08/10/85	1.05	2.31	46.5	18.31	4.80		0.93
LK MICH	GRID 1502	08/10/85	9.50	20.90	47.0	18.50	2.10		0.34
LK MICH	GRID 1502	07/15/85	0.90	1.98	47.5	18.70	0.70		0.30

CHINOOK SALMON

------------------------------ZONE=SOUTHERN ZONE------------------------------

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1502	08/10/85	1.05	2.31	47.5	18.70	1.20		0.26
LK MICH	GRID 1502	08/10/85	1.20	2.64	49.0	19.29	3.00		0.60
LK MICH	GRID 1502	08/10/85	1.15	2.53	49.0	19.29	2.80		1.10
LK MICH	GRID 2102	09/07/85	1.40	3.08	50.5	19.88	4.00		0.91
LK MICH	GRID 1502	07/17/85	1.05	2.31	50.5	19.88	1.00		0.20
ROOT R	SIXTH ST	09/19/85	.	.	50.8	20.00	3.00		0.90
SHEB R	KIWANIS PK	09/25/85	.	.	51.2	20.16	6.00		1.30
LK MICH	GRID 2102	09/07/85	1.50	3.30	52.0	20.47	2.70		0.49
LK MICH	GRID 1502	08/10/85	1.40	3.08	52.0	20.47	3.60		0.65
LK MICH	GRID 1502	08/10/85	1.25	2.75	53.0	20.87	0.70		0.28
LK MICH	GRID 1502	08/10/85	1.65	3.63	53.5	21.06	4.40		1.10
LK MICH	GRID 1502	08/10/85	1.55	3.41	54.5	21.46	1.60		0.51
LK MICH	GRID 2102	09/07/85	1.85	4.07	55.0	21.65	2.60		0.45
SHEB R	KIWANIS PK	09/25/85	2.50	5.50	57.8	22.75	5.00		2.60
LK MICH	GRID 1502	08/10/85	2.00	4.40	59.5	23.42	3.90		1.10
SHEB R	KIWANIS PK	09/25/85	2.75	6.05	61.7	24.28	8.00		3.10
LK MICH	GRID 2102	06/01/85	2.22	4.88	62.5	24.60	9.00		1.10
LK MICH	GRID 1502	08/10/85	2.35	5.17	62.5	24.60	0.78		0.26
LK MICH	GRID 1502	07/15/85	3.10	6.82	63.0	24.80	8.80		2.60
LK MICH	GRID 2102	06/01/85	2.16	4.75	63.5	25.00	8.20		1.20
LK MICH	GRID 1502	08/10/85	2.40	5.28	65.0	25.59	0.82		0.31
LK MICH	GRID 2102	06/01/85	2.19	4.82	65.0	25.60	5.50		0.91
SHEB R	KIWANIS PK	09/25/85	3.00	6.60	67.3	26.50	3.90		2.00
LK MICH	GRID 2102	09/07/85	2.90	6.38	67.4	26.54	4.30		0.92
SHEB R	KIWANIS PK	09/25/85	3.80	8.36	67.5	26.57	3.30		1.20
SHEB R	KIWANIS PK	09/25/85	.	.	68.6	27.00	2.50		2.10
LK MICH	GRID 1502	08/10/85	3.05	6.71	69.5	27.36	4.40		0.99
LK MICH	GRID 2202	07/20/85	2.90	6.38	70.0	27.56	0.80		0.35
LK MICH	GRID 2102	06/01/85	3.01	6.62	70.6	27.80	6.20		0.80
SHEB R	KIWANIS PK	09/25/85	3.50	7.70	70.9	27.90	1.30		1.20
LK MICH	GRID 2102	06/01/85	4.00	8.80	71.1	28.00	16.00		0.90
SHEB R	KIWANIS PK	09/25/85	3.70	8.14	71.8	28.25	1.80		2.60
LK MICH	GRID 1502	08/10/85	3.55	7.81	72.0	28.35	5.70		1.30
LK MICH	GRID 2102	06/01/85	3.46	7.61	72.4	28.50	7.60		2.00
LK MICH	GRID 1502	08/10/85	3.00	6.60	72.5	28.54	1.70		0.63
LK MICH	GRID 1502	08/10/85	4.10	9.02	74.0	29.13	1.90		1.20
LK MICH	GRID 1502	08/10/85	3.10	6.82	74.0	29.13	2.60		1.10
LK MICH	GRID 1502	06/29/85	3.75	8.25	74.5	29.33	7.10		1.50
LK MICH	GRID 1502	08/10/85	3.90	8.58	75.0	29.53	5.20		1.60
LK MICH	GRID 1502	08/10/85	3.95	8.69	75.5	29.72	10.50		1.30
SHEB R	KIWANIS PK	09/25/85	3.95	8.69	75.6	29.75	2.30		1.40
LK MICH	GRID 1502	08/10/85	4.70	10.34	76.0	29.92	4.30		1.00
LK MICH	GRID 1901	06/29/85	5.20	11.44	77.0	30.31	9.80		2.50
LK MICH	GRID 1502	08/10/85	4.25	9.35	78.0	30.71	5.90		1.30
LK MICH	GRID 2102	06/01/85	4.66	10.25	79.0	31.10	6.60		1.70
SHEB R	KIWANIS PK	09/25/85	.	.	79.2	31.18	2.60		1.80
LK MICH	GRID 1502	08/10/85	6.00	13.20	79.5	31.30	3.80		2.00
LK MICH	GRID 2102	07/20/85	4.10	9.02	80.0	31.50	0.50		0.57
SHEB R	KIWANIS PK	09/25/85	6.85	15.07	81.8	32.20	4.70		2.80

CHINOOK SALMON

ZONE=SOUTHERN ZONE

WATERBDY	LOCATION	DATE	WT_KILO	WT_LB	LNGTH_CM	LNGTH_IN	PCT_FAT	LIMIT	PCB
LK MICH	GRID 1502	08/10/85	3.50	7.70	82.0	32.28	1.10		1.30
SHEB R	KIWANIS PK	09/25/85	.	.	82.2	32.36	2.30		2.40
SHEB R	KIWANIS PK	09/25/85	.	.	82.5	32.48	3.10		2.30
LK MICH	GRID 1502	08/10/85	5.60	12.32	82.5	32.48	4.40		2.20
LK MICH	GRID 1502	08/10/85	6.45	14.19	83.0	32.68	5.10		1.40
LK MICH	GRID 2102	07/20/85	5.80	12.76	84.0	33.07	9.30		2.80
SHEB R	KIWANIS PK	09/25/85	.	.	84.7	33.35	2.40		2.10
LK MICH	GRID 2102	06/01/85	6.40	14.08	85.1	33.50	7.50		2.10
SHEB R	KIWANIS PK	09/25/85	.	.	85.5	33.66	2.60		2.80
LK MICH	GRID 1901	06/25/85	6.05	13.31	86.4	34.00	9.00		3.90
LK MICH	GRID 1502	08/10/85	5.80	12.76	87.0	34.25	4.50		2.30
LK MICH	GRID 1502	08/10/85	6.30	13.86	87.5	34.45	4.80		2.60
LK MICH	GRID 2102	09/07/85	7.25	15.95	87.8	34.57	3.00		1.20
LK MICH	GRID 2102	09/07/85	7.75	17.05	88.2	34.72	1.50		1.20
LK MICH	GRID 2102	09/07/85	5.95	13.09	88.6	34.87	1.50		0.80
LK MICH	GRID 2102	06/01/85	5.23	11.51	89.4	35.20	3.00		1.90
LK MICH	GRID 1502	07/15/85	8.10	17.82	89.5	35.24	4.60		2.40
SHEB R	KIWANIS PK	09/25/85	.	.	89.8	35.35	2.60		3.80
SHEB R	KIWANIS PK	09/25/85	.	.	91.0	35.83	5.30		2.40
LK MICH	GRID 2102	07/20/85	7.60	16.72	93.5	36.81	6.20		2.70
SHEB R	KIWANIS PK	09/25/85	.	.	95.3	37.52	3.00		4.00
LK MICH	GRID 2002	06/21/85	10.32	22.70	96.5	38.00	11.00		2.40

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